The Model Engineer

A Journal of Small Power Engineering.

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Our Point of View.

To Our Visitors.

Before many hours have passedwe shall once again be occupied in the performance of a series of pleasant duties which had their inception many years ago-in 1907, the year in which the first MODEL ENGINEER Exhibition was held. On that occasion the greater number of model engineers and their friends mhom we met were, naturally, strangers to us; we had met only in the pages of our journal. Since then the stranger element has gradually diminished year by year, each occasion assuming more markedly the character of a re-union of mutual interests than a gathering of sightseers looking for novelty. But in welcoming old friends, we must not be unmindful of the growing influx of new ones. To many of them the real purport of all they will see may need some explanation-but they will find many willing tongues ready to give them all the information they may seek.

* * *

What to Look For.

Broadly, the Exhibition is composed of three sections-(r) the productions of individual effort, comprising mechanical, electrical, and other scientific models and apparatus entered for competition, and a similar type of work, but not eligible for competition, in the Loan Section. Secondly, there n-ill be the Clubs Section—that is, the grouped collection of models by members of many of the well-known model engineering societies and power and sailing boat clubs of London and its suburbs. And, thirdly, there is the Trade Section.

The Origin of Many Models.

Probably one of the first questions to arise in the mind-of the new visitor to the Show is, "How is one to set about suchlike work?" The answer can only be " By a process of careful selection." If there is one failing more common and more prevalent than another to which the newcomer to model engineering is heir it is that of attempting complicated work too early in his career, particularly if he is not, to begin with, naturally adaptable to mechanical work, or is without previous experience in the handling of tools and workshop appliances. This lack of conception of what is really involved in model work is not confined by any means to folk who, by virtue of their ordinary occupation, have had no reason or need to give thought to the matter. It prevails in quarters where one would least expect to find it. Only last month we introduced one of the leading model engineers of the day to a firm of shipbuilders who wished to have a model steam dredger built for exhibition purposes. A fen- days after the introduction, he came in to see us with a blue print under his arm measuring nine feet long. It n-as a *general arrangement drawing only* of the dredger, full size of the required model, and indicated that the job would include a mass of auxiliary machinery common to vessels of that type, each item of which would have involved as much work as the compound engine illustrated in our present issue. Two years at ten hours a day would not have enabled a model-maker of the first rank to complete the hull and main engines; and yet the firm asking for

tenders wished for a scale model complete with all auxiliaries to be ready for the big exhibition at Wembley in April next! When such ideas can emanate from sources intimately concerned with engineering work, one cannot fairly deprecate the general tendency of the stranger to regard real model work as the product of a few leisure hours. What, then, can the beginner do, and how can he commence "a process of careful selection"? He can commence by reviewing, as fully as his time and inclination will permit. the work of other modellers, a vast record of which will be found in the back numbers of THE MODEL ENGINEER. Single copies of most of the issues are still to be had, but were we bent on his errand we should prefer a few of the bound volumes. Each volume contains one half-year's issues, and as much of the subject matter contained therein is presented, and then discussed and developed with a natural sequence, the reading up of any given subject is at once found both acceptable in form and instructive in effect. Our representatives, who will be in attendance at the *M.E.* Stand throughout the Exhibition, will gladly advise any inquirer in search of reading matter on any particular subject.

* * *

Auxiliary Information for Model Engineers.

But besides the M.E. itself. the potential model engineer will find on the *M.E.* bookstall a mass of other reading matter to browse in. Amongst this the *M.E. series* of 9d. handbooks will attract his attention. be his interests ever so diverse. There are over fifty to select from, each dealing with a distinct subject, and each based upon the practical experience of its author. Then a perusal of our complete book-list will reveal the fact that a new series-" The Practical Workshop Series "-has just been started, and so far Nos. 1, 2, and 3 have been published. These little works are also "auxiliaries," and are designed to meet the needs of the man uith a workshop who is wise enough to be not above gleaning useful information where and when he can. No. 1 is on "Marking out for Machinists," No. 2 on "Practical Hand Forging," and No. 3 *on* "Fitting and Adjusting Bearings." We hardly know which should be read first. That depends so largely upon the inclination of the reader, in what his experience consists. It may be said, however, that the author, Captain Richard Twelvetrees, A.M.I.Mech.E., M.S.A.E., M.Soc.Ing.Civ., has succeeded in introducing a surprising amount of practical advice into a very small compass; has treated his subjects in a logical way, and presented what he has to say in a very readable form. These. then. are a few of the things and factors which go to make "the origin of many models," and we beg the visitor, who is this week becoming, perforce, only superficially acquainted with the world of model engineering, to ponder our suggestions.

The Yacht Model Racing Association.

What's in a name? That is the question at present agitating the minds of many model yachtsmen, for it is proposed to re-christen the Model Yacht Racing Association. Opinions are divided; but we think, now that its Constitution has been so improved, it could not adopt a better title than the Yacht Model Racing Association, and yet we learn that there are some who would like to see it The Model Yachting Association. There is a very good reason for the title we uphold. The words "model yacht" are in general use by the public as describing any kind of toy-shop production, and ordinary people do not recognise any difference except in size and price and paint. For years the leading model clubs have been interested in the motion of yacht models such as the B.R.A. Class, the International Class, and, lastly, the 2-inch to the foot 6-Metre Class for International racing. All these are strictly yacht models in design-so, also in a way are the 10-Raters, which are built from designs. and may be said to be models of the ex-24-Footer Class, which is still racing. A model yacht (as the public understand it) can be bought in any toy-shop, but a yacht model has to be designed and built by experts. Bearing these facts in mind, we are surprised to hear that those who are so keen on racing yacht models should not express the difference in the title of their association. As the annual general meeting of the (at present) M.Y.R.A. is to be held towards the end of this month, we may still hope the good sense of the meeting will see to it that the body it represents gets a name befitting its scope, activities, and aspirations. And so now that unrest within its ranks is stilled, may we express another hope: that its members will settle down to design and build, and race; that its leading spirits will try to elucidate for the benefit of the less experienced yacht builders matters of moment pertaining to the scientific and practical side of the subject, say, by means of lectures and demonstrations; and, finally, that the association will before very long be able to exercise a beneficial influence in the obtaining of more and better sailing waters wherever they are needed throughout the country. The fact that individual citizens may now become members, whether they are attached to any local club or not, should go far towards strengthening its position and fitting it to tackle such work successfully. Mr. C. N. Forge, the Hon. Secretnry, 151, Lichfield Grove. London, N.3, will supply any of our readers who so desire with further particulars of the association.

MESSRS. BASSETT-LOWKE, LTD., ask us to state that many of the models described in our recant article on "Commercial Models" were built to enquiries received by them, and handed on to Messrs. Twining Models, Ltd., for whom they were acting as sole concessionaires.

Man, Petrol, and Electric Power Plants for Pumping.

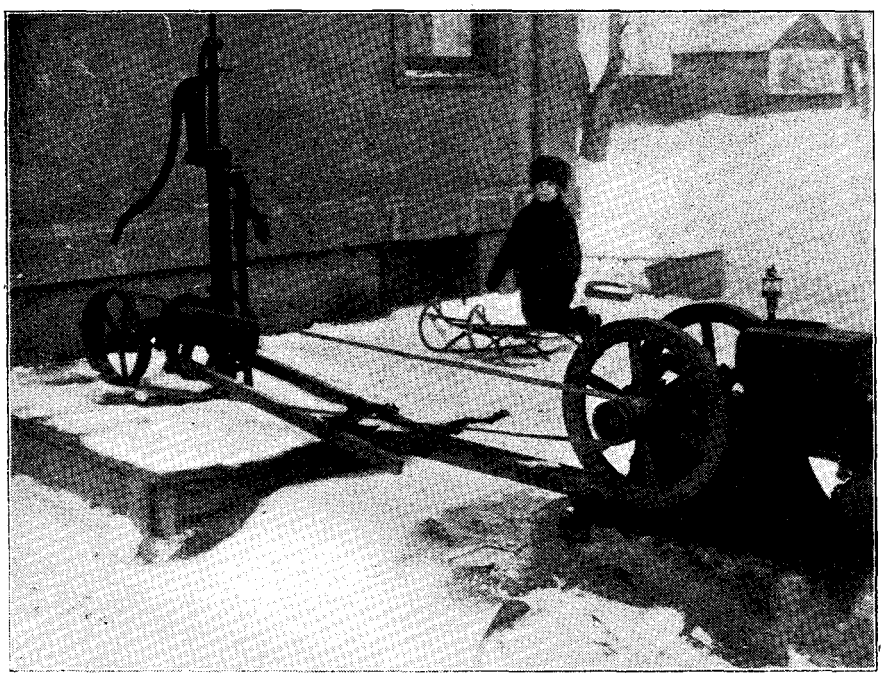
With Some Reference to Steam.

By HOMER S. TRECARTIN (New Jersey, U.S.A.)

I AM one of those who read with especial interest the discussion early in 1923 anent small internal combustion engines. About ten years ago I was bitten with the bug of making things, and I fitted up a small workshop with a Barnes' screw-cutting bench lathe, a grindstone and an emery wheel, and I purchased a "two cycle" gasoline engine to furnish power. The engine ran at 800 r.p.m., controlled by a centrifugal governor acting on the throttle. It was rated at 3 h.p., if I remember. Until I got it bolted to a concrete base, weighing about a ton, the little thing used to travel all over the shop on its skids, nails and screws very quickly giving up the unequal struggle. It had a muffler; but one stopped trying to talk when it exploded 400 times a minute. After I led the exhaust far away through a long pipe and overcame some of the vibration with sheer mass of concrete, the machine became something of a comfort. It would many times refuse to start for half an hour, then run fine all through no discernable cause, and it would four cycle, and eight cycle, and at times "hit" about every ten seconds, and do all sorts of weird things. I used to "cuss" it often, but what couid one do? It was better than a foot treadle, and I do not believe many of such small two-cycles are any better than it was. I took it apart for some reason, and it took two men two days to get one fy-wheel off. It was well put together!

Since then I have had much experience with small gas engines, and the only place I care for the two cycle design is in a motor-boat where the load is virtually constant-and even then I think the four cycle is better.

I forgot that I wanted to explain that I subscribed to the MODEL ENGINEER in those days, and read every word, including the advertisements. I again am a subscriber, and read with no less interest; although in those days I had to learn what a "tap" or a "die" was, while to-day I call myself a mechanical engineer, and an electrical engineer, and have designed and manufactured some pretty complicated electrical-mechanical devices.



"--and when my neighbour is filling his gas tank with gasoline, screwing down grease cups, pouring water into the hopper, putting the belt on, or lacing it when it breaks-"

To come back to the gas engine. I recently built a new home. (The carpenters built it (at $10 a day). I paid for it.) There was no water supply there, so I had a well driven in back of the house, 90 feet deep. For a while I pumped the required water into the tank in the attic

with my one-man-power mechanism—but no engineer would do that long! (About 15 minutes was a day's work).

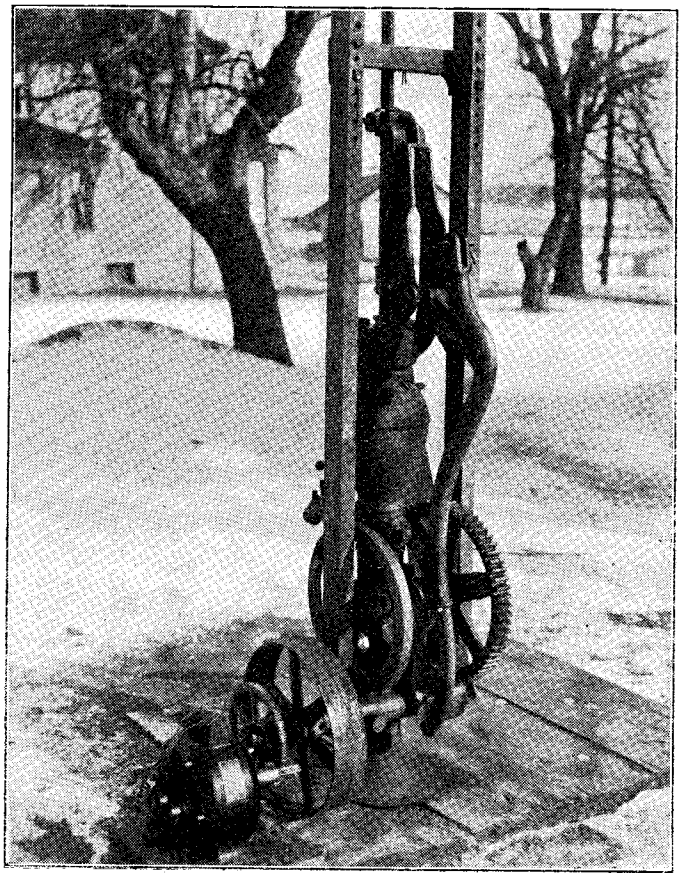
I watched my neighbour with his similar pump, which he drove with a gasoline engine, and he used to go out and start it when he saw me pumping, just to make me feel bad, I believe. But if we did not have city water, we did have electricity, 110 volts, A.C. 60 cycle, at about 12 cents a kilowatt hour. And, thinking of all the gas engines I had owned and operated and had seen operated, I decided to use electricity.

I ignored the advice of all the pump and engine people as to the power required, and I figured it out myself. Then I bought a 1-6th h.p. "used" motor for $12. It was single phase, A.C., 1,200 r.p.m. I fastened a six-tooth pinion rod on the end of the motor shaft with a sleeve and two set screws, and put a 120-tooth gear on the pump jack-shaft in place of the belt pulley. The pinion and gear were 20-pitch, the gear being 6 ins. diameter.

The shaft was geared 5 to 1 to the pump cranks, so the two reductions, 20 to 1 and 5 to 1, gave a pump-crank speed of 12 r.p.m.

The whole rig looked hopelessly small, compared to the gasoline engine on its heavy concrete base. The pictures show the comparison.

Now, when the water in the tank gets low we turn a switch. In about two hours the 250-gallon tank in the attic is full, enough to last a week, at a cost of about four cents. Now, when my neighbour is filling his gas tank with gasoline, and screwing down grease-cups, pouring water into the hopper, putting the belt on, or lacing it when it breaks, I turn my switch and make him feel bad.



——"I turn my switch on and make him feel bad".

To speak of steam—it is the law in this State that any power steam plant must be in charge of a licensed engineer; and they all get 40 or 50 dollars a week. Even the firemen must be licensed in New Jersey. They are paid 30 to 40 dollars weekly.

A Model Compound Condensing Engine.

By C. S. Barrett.

(With Coloured Supplement Presented with this Issue.)

ABOUT 1902, when I was serving my apprenticeship with a firm of lift engineers, a friend, who was serving his with the Thames Iron Works, became fired with the ambition to build a decent-sized compound engine. He was not particularly keen on a purely marine engine as I had expected him to be, but thought he would make it a non-reversing engine for dynamo driving. With this end in view, and with the experience gained in constructing several simpler models, I prepared a set of drawings for him and had the patterns made for the engine proper; the condenser was not decided on till later.

A set of castings was made by the Cannon Foundry, of Goswell Road, and he got to work, completing the boring of the cylinders, planing bed plate and fitting main bearings, machining crankshaft (from forging) and cylinder covers, whilst I prepared drawings and patterns for the air pump.

After about twelve months on it (at intervals) his enthusiasm began to wane, and his fancy turned to gas engines; the poor old compound was put on the shelf, and the new love gained all his attention.

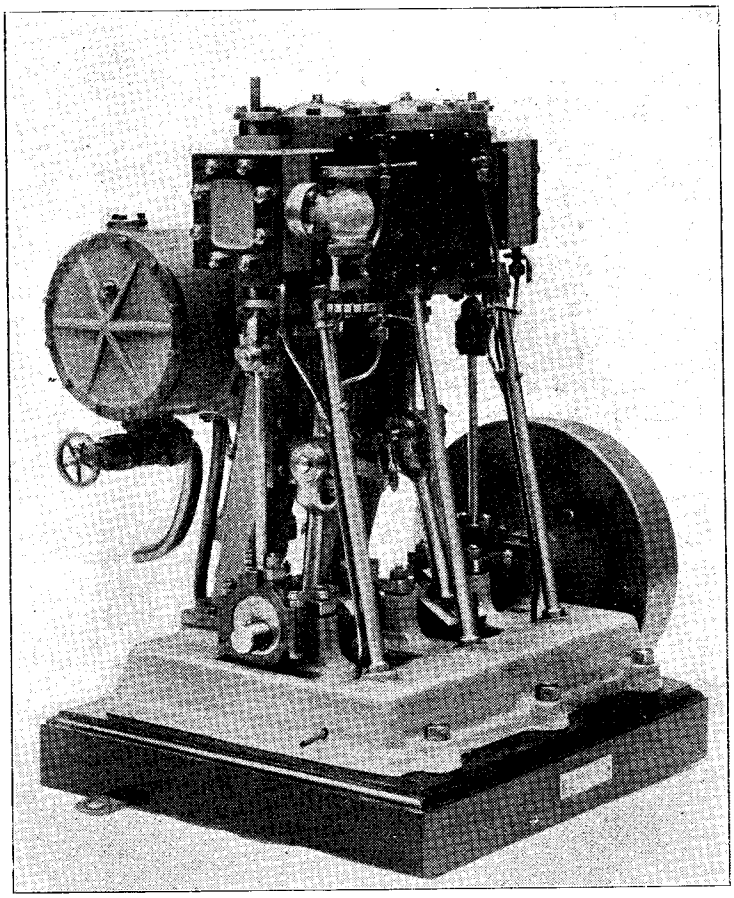
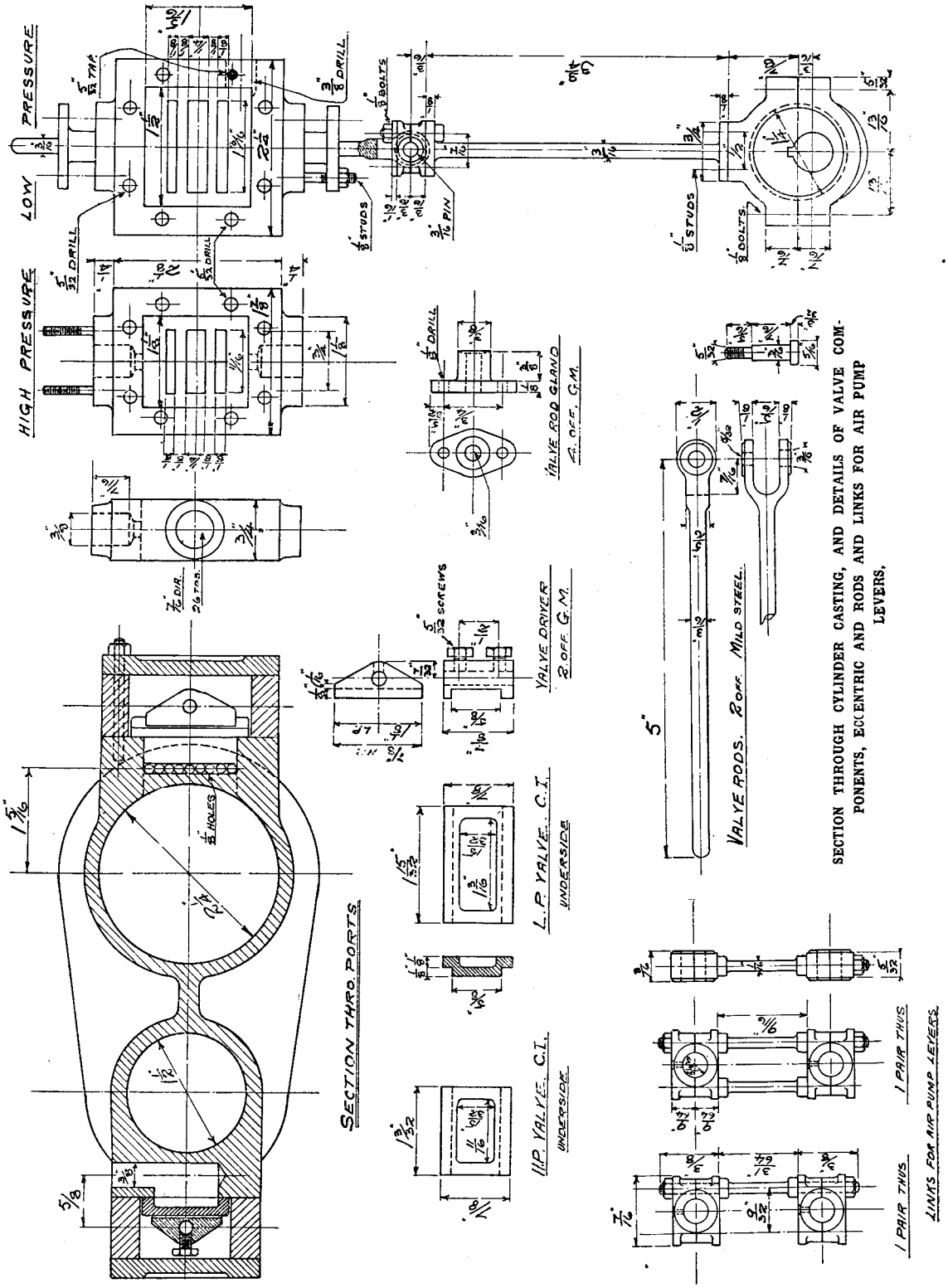


Fig. 1.—The Completed Model Compound Condensing Engine.

He then went to sea for a year or two, and I heard nothing further of the compound until 1909, when he had given up model work altogether. I was at his home one evening looking over a quantity of odds and ends, and we came across the pieces and patterns of the compound, when he asked me if I would like to take them over and finish the job; needless to say, I

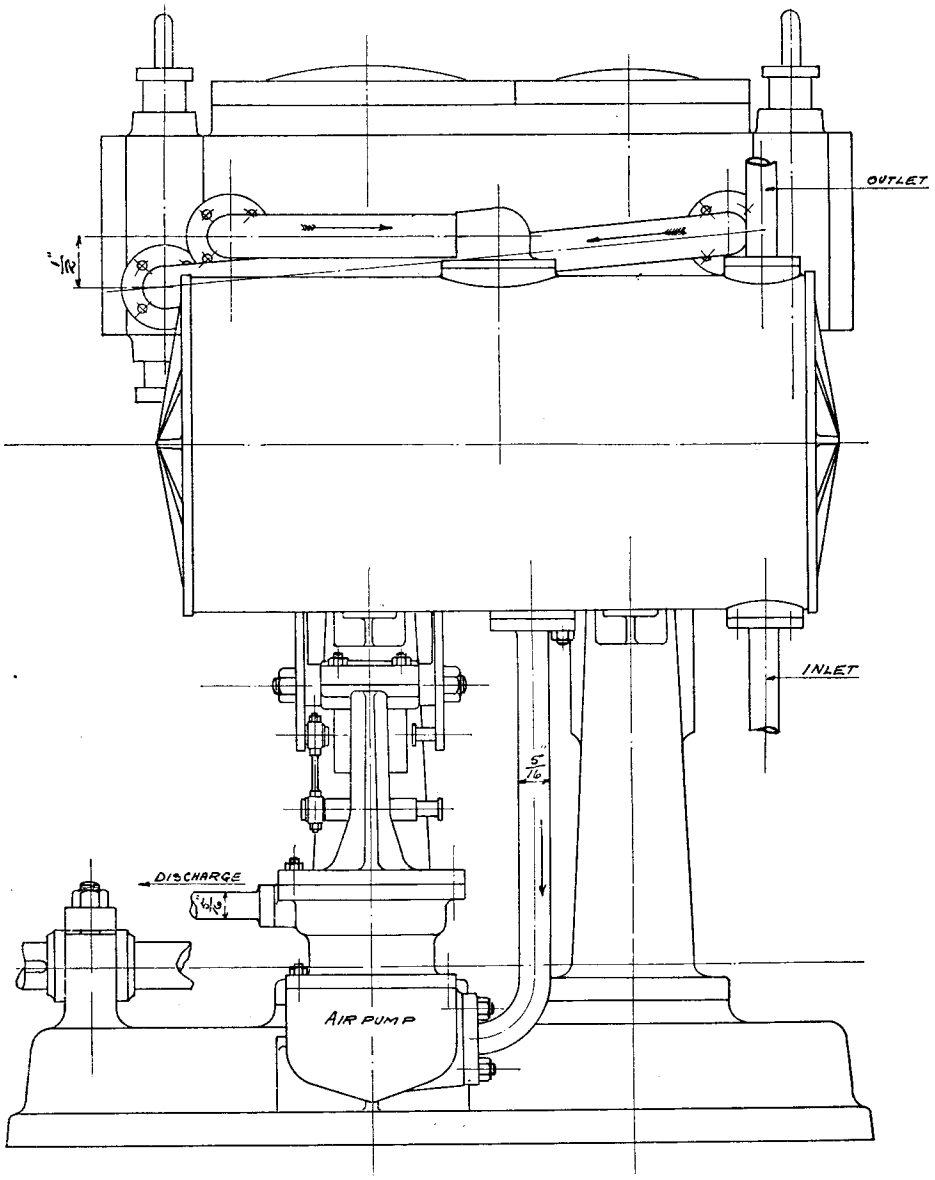


SECTION THROUGH CYLINDER CASTING, AND DETAILS OF VALVE COMPONENTS, ECCENTRIC AND RODS AND LINKS FOR AIR PUMP LEVERS.

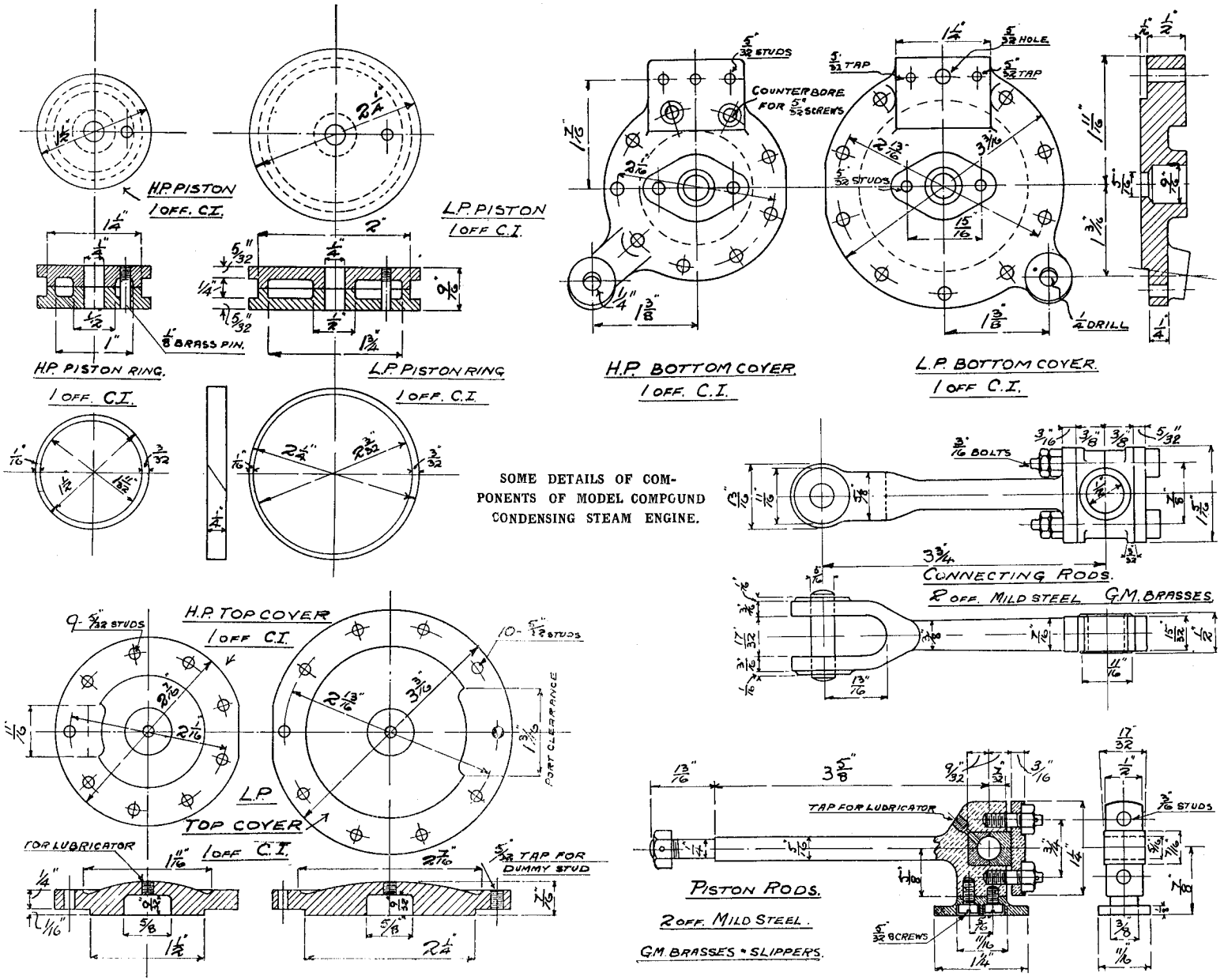
jumped at the opportunity and took the lot home.

The first thing I did was to examine everything thoroughly and scrap the following parts: all cylinder covers, both steam chests and covers, and piston rods, procuring new castings and forgings for these; then I prepared a new set of drawings, as the old ones had disappeared. The cylinders were lapped out, ports trimmed up and one or two incorrect stud holes plugged; the new chests and covers were faced up in the lathe and bored for rods and double stuffing boxes. Pistons are of magnalium, and in two parts, with a single cast-iron ring $\frac{1}{4}$-in. wide between them.

The rings were turned from a bush casting held in the chuck, and were first bored to a size which would give the correct diameter when split and closed, then the outside was rough-turned to 1-32nd in. over finished size, after shifting the bush in the chuck to give the required eccentricity. The next operation was to part the ring off the bush, and face the sides



Elevation (Condenser Side) of Model Compound Condensing Engine.


H.P. PISTON
1 OFF. C.I.
L.P. PISTON
1 OFF C.I.
1/8 BRASS PIN.
H.P. PISTON RING.
1 OFF. C.I.
L.P. PISTON RING
1 OFF. C.I.
H.P. BOTTOM COVER
1 OFF. C.I.
L.P. BOTTOM COVER.
1 OFF C.I.
1/2 DRILL
SOME DETAILS OF COMPONENTS OF MODEL COMPOUND CONDENSING STEAM ENGINE.
3/16 BOLTS
3 3/4" CONNECTING RODS.
2 OFF. MILD STEEL. G.M. BRASSES.
H.P. TOP COVER
1 OFF C.I.
L.P. TOP COVER
1 OFF. C.I.
FOR LUBRICATOR
PORT CLEARANCE
PISTON RODS.
2 OFF. MILD STEEL.
G.M. BRASSES & SLIPPERS.
TAP FOR LUBRICATOR
5/32 SCREWS
3/16 STUDS

to correct fit between the flanges of the piston; then the ring was split at 45 degs. at its thinnest part and the joint carefully filed to close fit. A jig was then prepared (see next issue for sketch). A spigot was turned on a piece of material A to fit the bore of the ring when closed, its width being slightly less than that of the ring, a thick washer B made and attached by setscrew C. A clip of thin springy material D was made, placed over the ring and tightened up by the bolt, so as to draw the split in the ring quite close; finally, setscrew C tightened up and the ring turned to exactly fit the cylinder. Of course, the spigot on A is set slightly eccentric to suit the ring, and when released the ring opened out, and on the first insertion in the cylinder there was a good bearing equally all round the outer surface. The above may seem a very elaborate method of making a simple article, but it is labour well paid, as the rings are absolutely steamtight.

The piston rods were made from forgings, machined to dimensions shown on drawing, and fitted with G.M. split brasses. Connecting rods are also made from forgings, the G.M. brasses being machined on all faces in the lathe to ensure accuracy, the exterior being finished on a mandrel after all parts were bolted together.

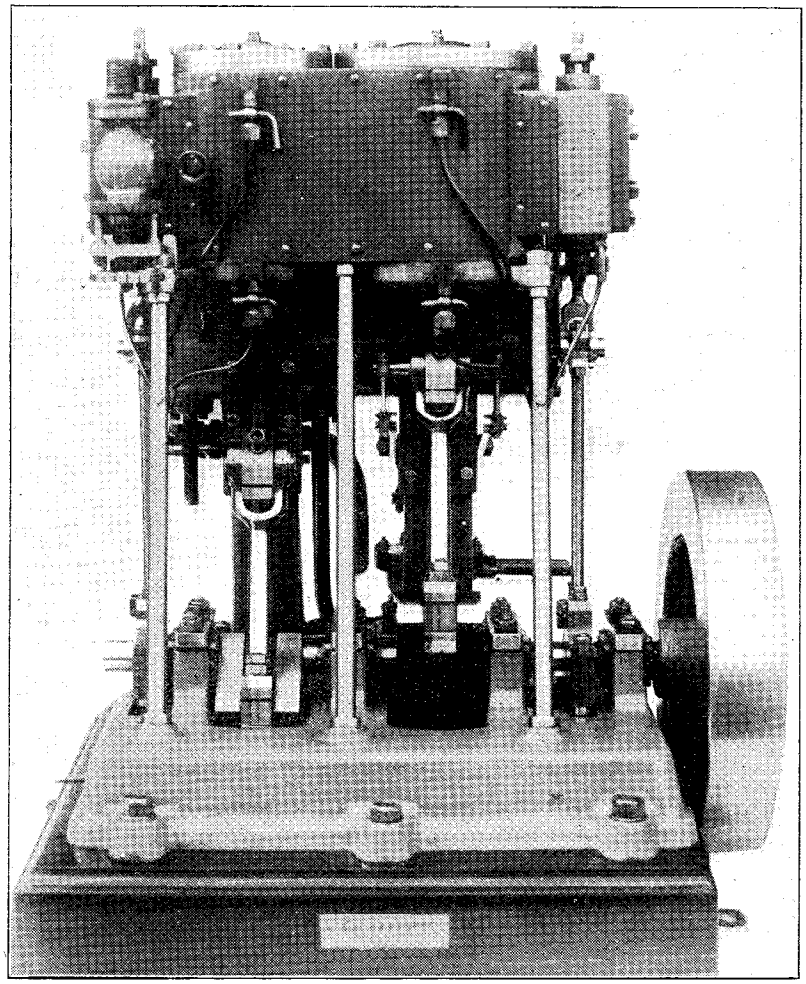


Fig. 2.—Front View of Model Compound Condensing Engine.

Crosshead pins are driven in and secured by a small screw each; the low pressure pin is extended to form journals for the air pump links.

The crankshaft forging was turned up in the usual way, with centre plates attached by set-screws for turning the pins; it is drilled through with a 3-32nd-in. hole for lubrication from main bearings to crank-pins as shown on drawings, and a $\frac{1}{8}$-in. keyway was end-milled in the lathe,

with shaft bolted on slide-rest. The bed plate calls for no special comment, except that the holes for the sloping columns were drilled with the aid of a wood block, which was cut to the correct angle on the drawing. This job, by the way, was carried out in the workshop at the earlier *M.E.* Exhibitions, as were the flywheel and the planing of the back columns.

The valves were certainly unorthodox, but give a maximum of length with a minimum of steam chest, without any tipping action in the driving. They are of cast-iron and were milled out of a piece of broken hydraulic cylinder. Eccentrics are of mild steel, secured by gib head keys in sunk keyways, those in the shaft being milled in the lathe, and those in the sheaves cut with a $\frac{1}{8}$-in. wide parting tool set sideways in a boring bar, whilst the sheave was held in the chuck. The top ends of the eccentric rods are fitted with split brasses, embracing a 3-16th-in. diameter pin, and they were faced on sides in the lathe after being bolted to rods.

There is a small by-pass starting valve fitted, consisting of a 3-32nd-in. diameter needle valve and hand-wheel, which opens a 1-16th-in. diameter drilled port leading from the H.P. steam chest to the H.P. exhaust port, and thence to the eduction pipe to the L.P. steam chest, thus passing sufficient steam to start the engine, should the H.P. crank be on the dead centre.

A $\frac{3}{8}$-in. clear way screw down steam stop valve is also fitted, details of which are shown on p. 14-15. The body casting for this was obtained from Messrs. Stuart Turner, and the hand-wheel was turned from mild steel, five spokes cut out with drill and file, and notches on square rim cut in the lathe, using change wheel as division plate. Cylinders are lagged with thin blue lagging steel secured with 1-16th-in. round-head steel screws. A good tip for fitting this, if of an awkward shape, is to cut out a temporary sheet in thin tin, bend into place, cut all necessary corners, etc., then flatten the whole piece out and use it as a template to cut the lagging sheet. I found it very successful.

Top and bottom cylinders and both steam chests are fitted with drain cocks, which are connected by unions to 3-32nd-in. diameter copper pipes, three of which, from the high pressure end, meet in a small junction piece fixed to the back of one column, and thence by a single $\frac{1}{8}$-in. diameter pipe down the column to the underside of the bedplate; the three from the low pressure end being similarly arranged and meeting the common pipe, thence out of the side of the bedplate. These details are clearly shown in one of the photographs appearing with these notes, and in another which will be reproduced next week. The condenser, of which detail drawings will also be given in the January 10 issue, is of brass tube, $3\frac{1}{2}$ ins. diameter, and No. 16 gauge.

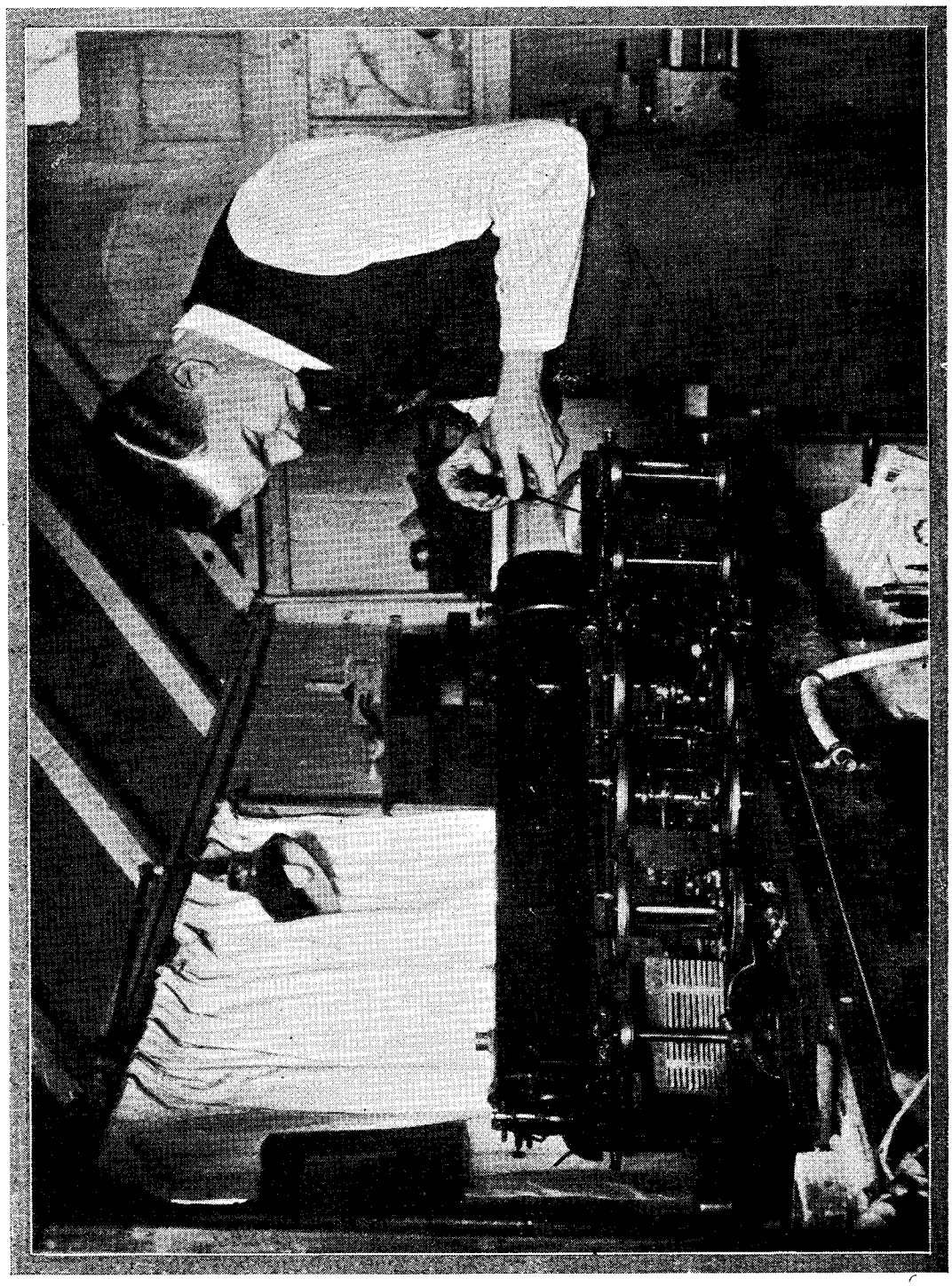
(To be continued.)

Model Engineers and their Work.

Mr. J. C. Crebbin.

MUCH water has flowed under the bridges since the publication of the issue of the MODEL ENGINEER for July, 1899. In its pages is a short article by James C. Crebbin, entitled "Some Models I Have Made," illustrated by photographs of a single-driver model locomotive of Great Western type, and which he terms his No. 3. The portrait accompanying the article is the presentment of a young man, but he had already been recognised as worthy to be a vice-president of the (then) Society of Model Engineers. He occupied this position from October, 1898, to November, 1901, and has been member of the committee from December, 1913, to November, 1915; again elected in December, 1921, and has been elected chairman at the last A.G.M. He has assisted with his locomotive, the now celebrated "Cosmo Bonsor," at every one of the six MODEL ENGINEER Exhibitions, giving pleasure to thousands of people and demonstrating what a wonderful thing a model locomotive can be. This unique and welcome record has been acknowledged by the presentation, from the organisers, of a MODEL ENGINEER silver medal of honour, one of the first two such medals which have ever been given.

Last March we received a letter from abroad, in which the writer asked us to publish accounts of celebrities in the model engineering world. Amongst others, he mentioned Mr. J. C. Crebbin, and remarked, "I, for one, am very interested, and continually wondering what his ordinary every-day occupation is. For all I know he may be president of a railway or greaser on a Thames steamboat. But whatever he is, I will lay that he knows his job." If we were going to write Mr. Crebbin into a story for a cinema film, we should entitle it "Big Heart," for this is his main characteristic—whether as a model engineer or in his dealings with other men. He was sent to Australia when ten years of age, owing to reasons of health, in a five-masted clipper sailing ship, and berthed with the bo'sun, carpenter and the donkeyman. He knew no one on board the ship. He remained in Australia until he was 14, then returned to London and went to school at Owen's College, Islington, where he surprised everyone by making a cylinder frictional electric machine with a gin bottle. The hair for the rubber was given to him by a carman from a horse's tail. He passed the Science and Art Examinations in Physics, Mathematics and Chemistry, but terms himself the biggest duffer at languages who ever existed. He obtained



MR. JAMES C CREBBIN IN HIS WORKSHOP OVERHAULING HIS MODEL LOCOMOTIVE "ALDINGTON."

the school a half-holiday through being specially commended in a Science and Art Department report for all the subjects he had taken. Being offered " any book you like to have " in commemoration of this praise, he surprised his master by choosing a book on mechanics; they were going to make him a classical scholar. He loved Euclid, because he thinks it was properly taught to him in Australia.

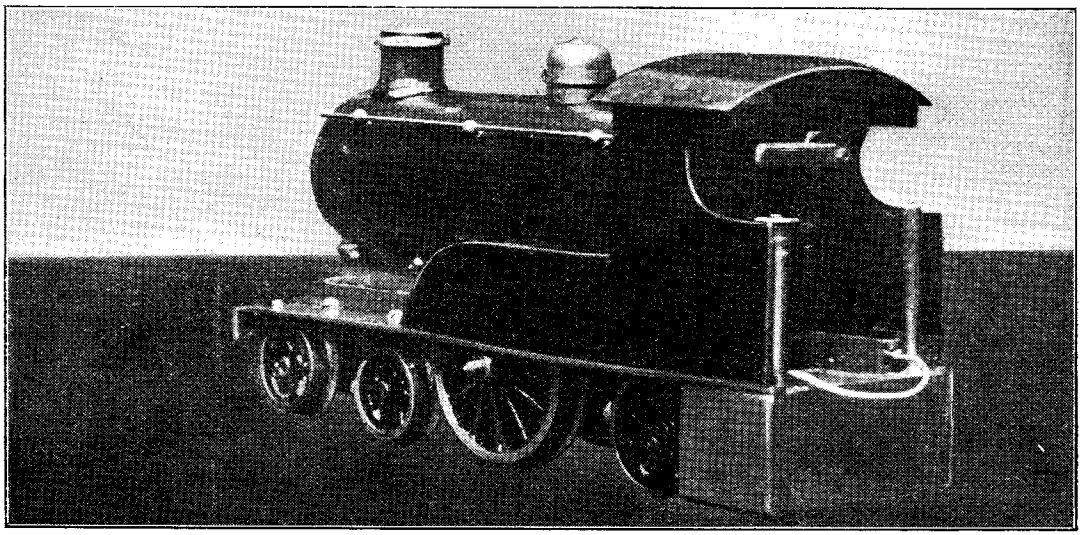
Upon leaving the college, he was apprenticed to to the drapery at Messrs. Dawson's, in the City Road, the hours of work being 8 o'clock in the morning until 9 and 10 o'clock in the evening, and no half holiday on Saturdays. Notwithstanding this arduous existence and no holidays, he made a portable rainproof tent, which packs up into a space of 2 ft. 6 in., and when set up is 5 ft. square by 7 ft. 6 in. high. It was erected at Bexhill during the family summer holiday. This tent was so well made that it is still in use. At the end of two years the strain of his uncongenial occupation caused his health to break down, and the doctor said if it was continued it would mean his end. The apprenticeship was accordingly broken off and he served for a short time with Messrs. Gordon & Co., distillers, stoking the boiler fires whenever he had a chance. Finally he entered the service of the Bank of England clerical side, and has continued in this up to the present time.

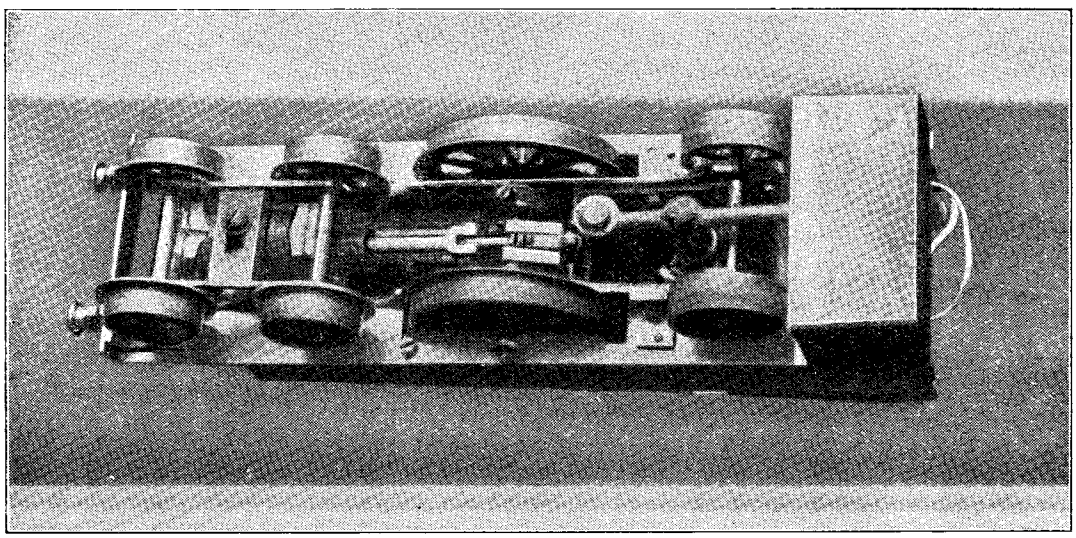
Though engaged thus in the occupeation of banking and immersed in such non-engineering details as dividend warrants and other financial scrip, he is by nature an engineer and mechanic. Parental disapproval tried to suppress this instinct. His father, thinking it detrimental to his health, discouraged model engineering and mechanical work, but " Big Heart " is very determined, especially when opposed. There was a windy garret in the house, containing a water tank, and he secretly adapted this garret as a workshop. As it had no floor he boarded over the rafters, working at midnight fixing the boards down with screws, so as to avoid making a noise and thereby inviting discovery. He built his present workshop, shown in the photograph, himself at a cost of £6 10s. It has been moved on two occasions. Later he built a model railway in his father's garden; it ran through trees and plantations. His bent toward mechanical work seems to be inherited; he thinks that his grandfather was principal shipwright at Wigram's shipbuilding yard, Blackwall, and an uncle, by marriage, owned a shipbuilding yard, one of the vessels constructd there being, to his recollection, a yacht for the Sultan of Zanzibar. When five years of age he used to visit this shipyard, and often watched the tugs going along the adjoining creek. He longed to make a working tug and realised his ambition in an original way. The hull was made from a block of wood. One of the mechanics shaped it with an adze and Mr. Crebbin finished it off with borrowed tools, fitted a funnel and imitation boiler to take cotton waste. This, when lighted, produced smoke in imitation of the real tugs. Propulsion was by means of an endless cord attached to stem and sterr of the model and fastened across the creek. By hauling the cord one way the model was drawn ahead, and by hauling the other way it was backed astern across the creek. This gave him great pleasure until the mysterious journeyings of the model led to him being discovered in a hiding place on the bank of the creek and punished for exposing himself to danger of falling in.

Before he was ten years of age he made an experimental model boat, 2 ft. long, fitted with oscillating engines and a boiler which had two water tubes. He made the rudder very tight and thought that nothing would cause it to shift from position. But when he ran the boat on the Round Pond in Kensington Gardens (the exhaust steam was discharged at the side of the boat) one of the ducks, not liking steam in its eyes, seized the tiller. This caused the rudder to shift and the boat continued to travel in a circle. In order to save the boiler from any consequences of steam running down, he waded out up to his shoulders and rescued the boat, and had to go home in his wet clothes. He made a second model boat when about 15 years old. She was fitted with a water tube boiler, which he still has, and two double acting slide valve cylinders to the engine. It was a battleship, and he is keeping the hull to give to his little son. Later he used the cylinders in a flash steam plant (he says " probably the first flash plant used in a model boat ") at the MODEL ENGINEER Regatta held at Wembley Park, Middlesex, July 25, 1908. This boat was named " Experiment." He had fitted novel ideas in connection with the flash boiler-feed water heater and mechanical lubrication, but the power of the engine was so great that the set-screw holding the engine fly-wheel gave way. This prevented running in the competition. An illustration of the old saying that " the strength of a chain is that of the weakest link." The mishap demonstrated that elaborate thought and construction may be nullified by the weakness of some trivial detail. In connection with model flash steam plant, Mr. Crebbin advocates the use of his " feed balancing arrangement." He considers that it is necessary to ensure successful working. The arrangement consists in the use of a feed-water balancer tank interposed between the generating coil and the feed-pump. An air pressure is pumped in this up to the working pressure of the boiler and is maintained during the working of the plant; a second pump is used to feed water into a feed reservoir. Another point is that he found that scale came

through and caused scoring of the cylinders and valves. To prevent this he fitted a long steam drum with gauze filters inside. Proof of their efficacy was shown by an accumulation of fine powder inside the drum. The hull of *Experiment* was designed by Mr. Blaney and

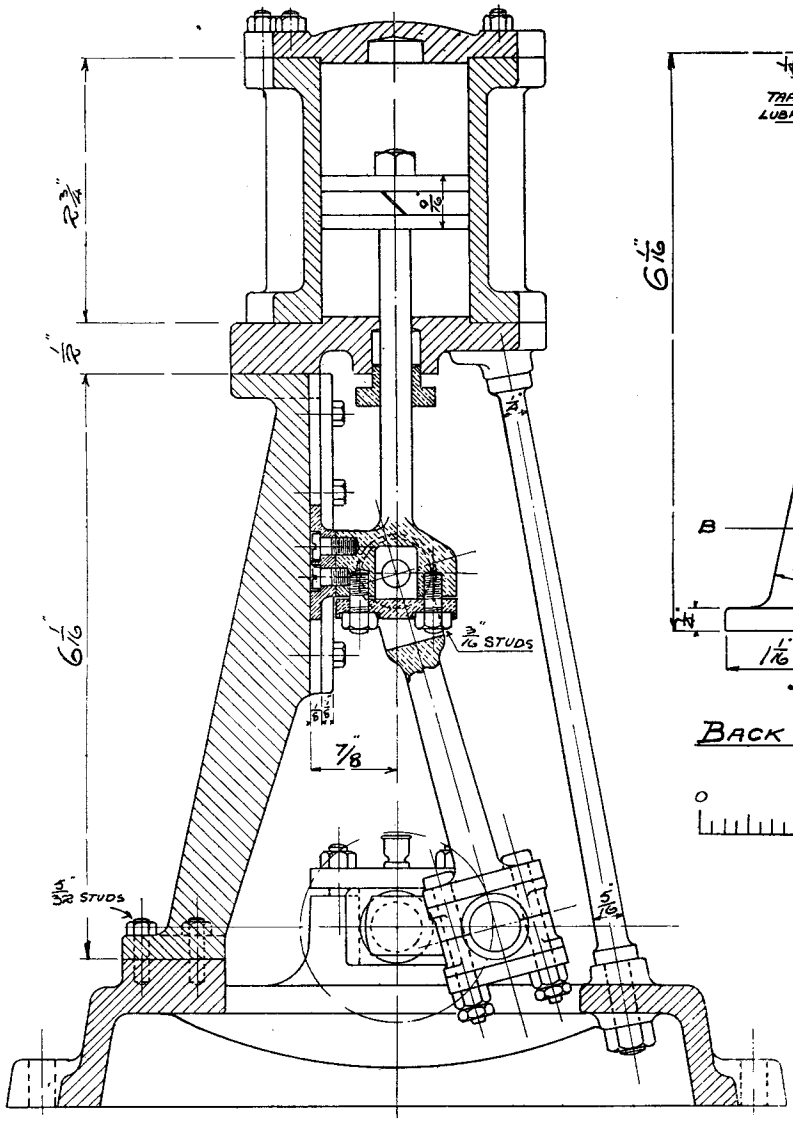
locomotive building was an improvement upon the well-known "Ajax" engines, the boiler being fitted with water tubes. The model was the outcome of a present to himself when he was 15 years of age of a brass "Ajax" engine, which would only run a distance of about 6 feet

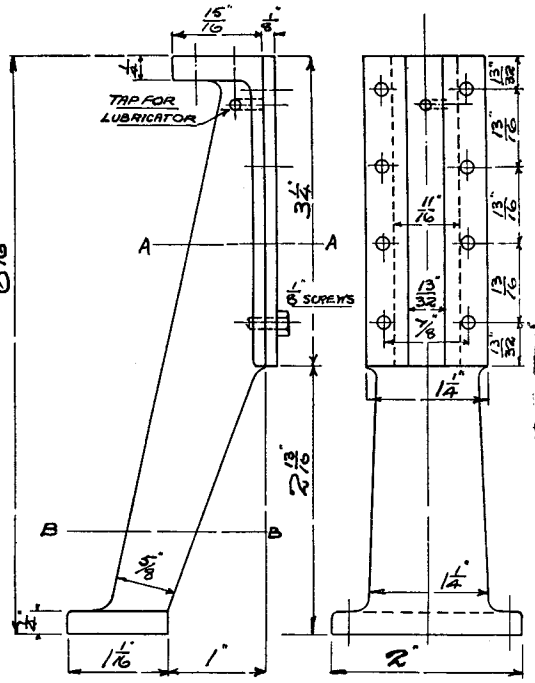




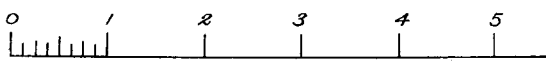
Top: Experimental Model Gauge 0 Loco with D/A Slide Valve Cylinder. Below: Underneath View of the same Locomotive.

built by Mr. Vanner. Mr. Crebbin at first installed in it a three-cylinder engine of novel construction, which he made for driving this boat. It was single acting and without valves. It had been previously used in a boat which was not a success; the bow used to rise and she would not steer. His first attempt at model and then stop for want of steam He used to run his modified "Ajax" on the floor of the lower kitchen without any rails. It was fairly successful in that it kept going. This was an entirely new engine. The cylinders were built up of brass tube. Mr. Crebbin at that time lived at the distillery, and used the lower

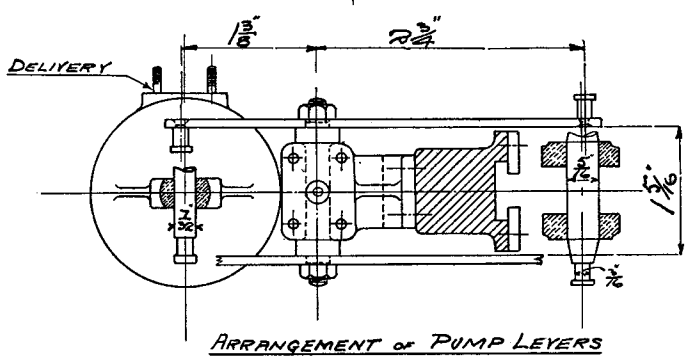




BACK COLUMNS. 2 OFF. CAST IRON.
MILD STEEL GUIDE PLATES.

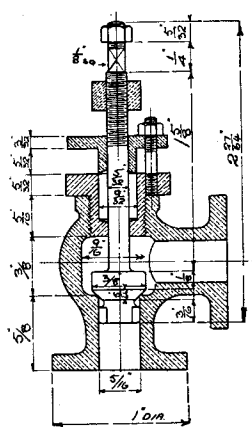


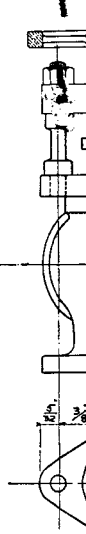
SCALE FOR ELEV TIONS AND PLANS OF EN



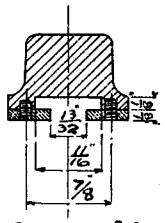
ARRANGEMENT OF PUMP LEVERS

For description see page 5 and]

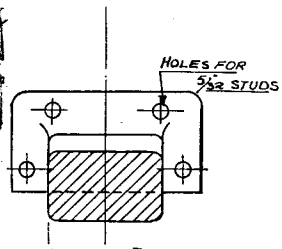




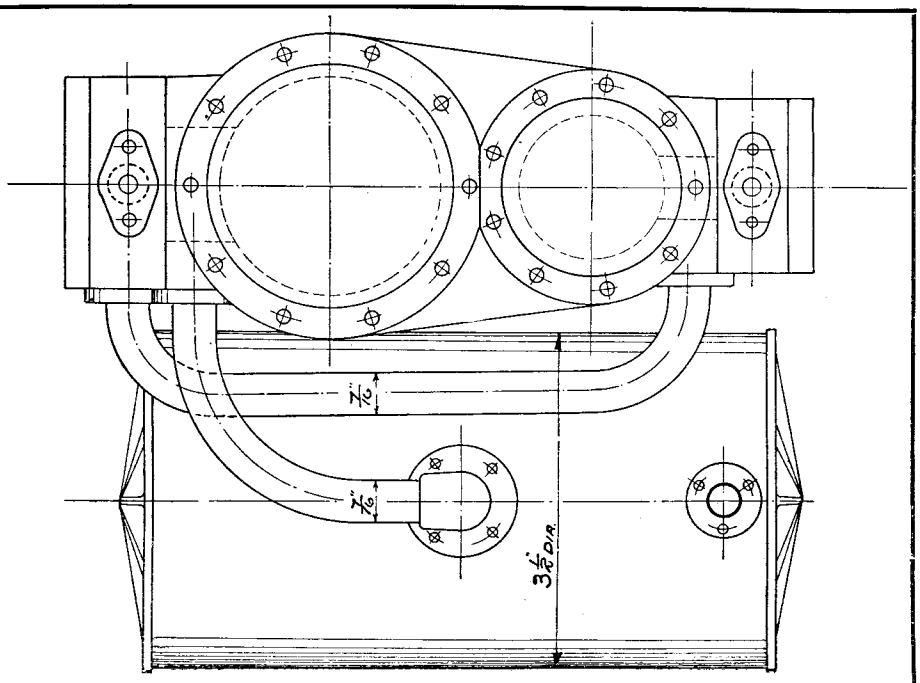
SECTIONAL ELEVATION, PLANS, AND SOME DET

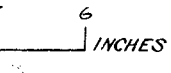


SECTION A-A



SECTION B-B





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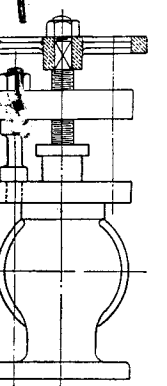
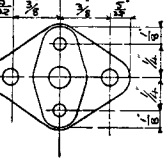
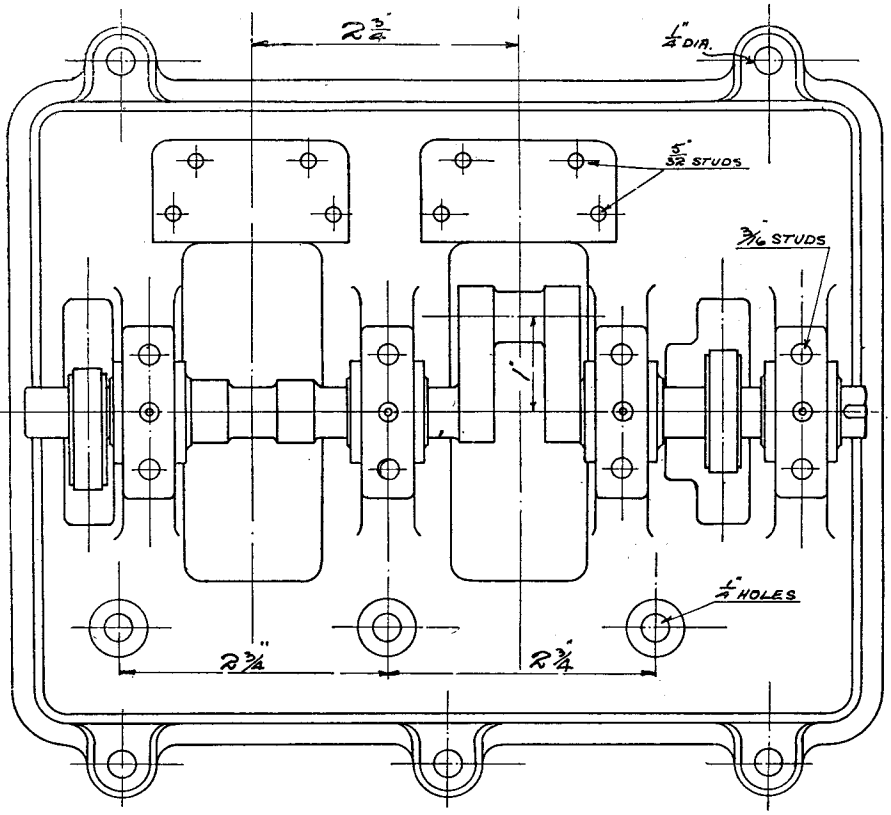
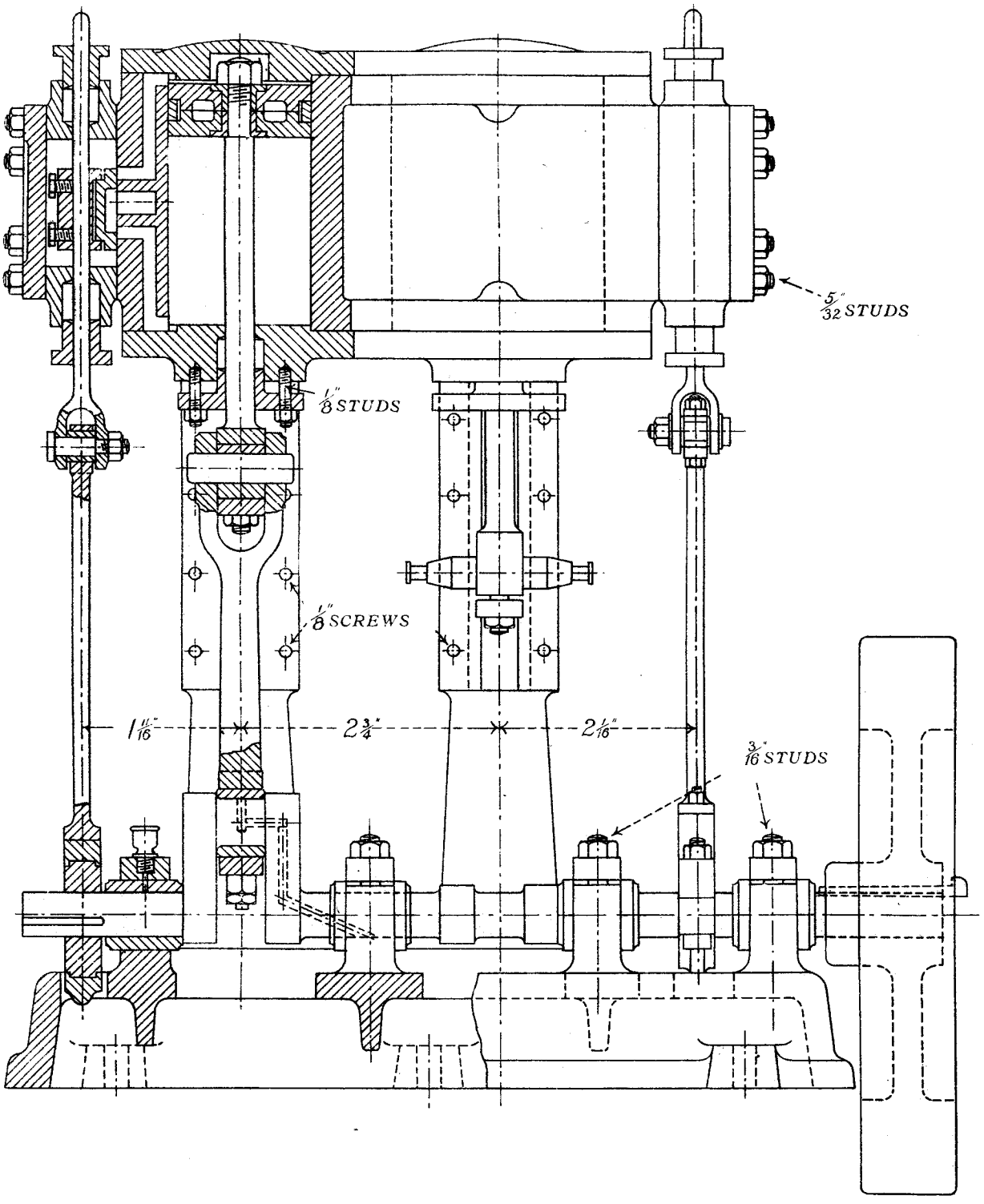




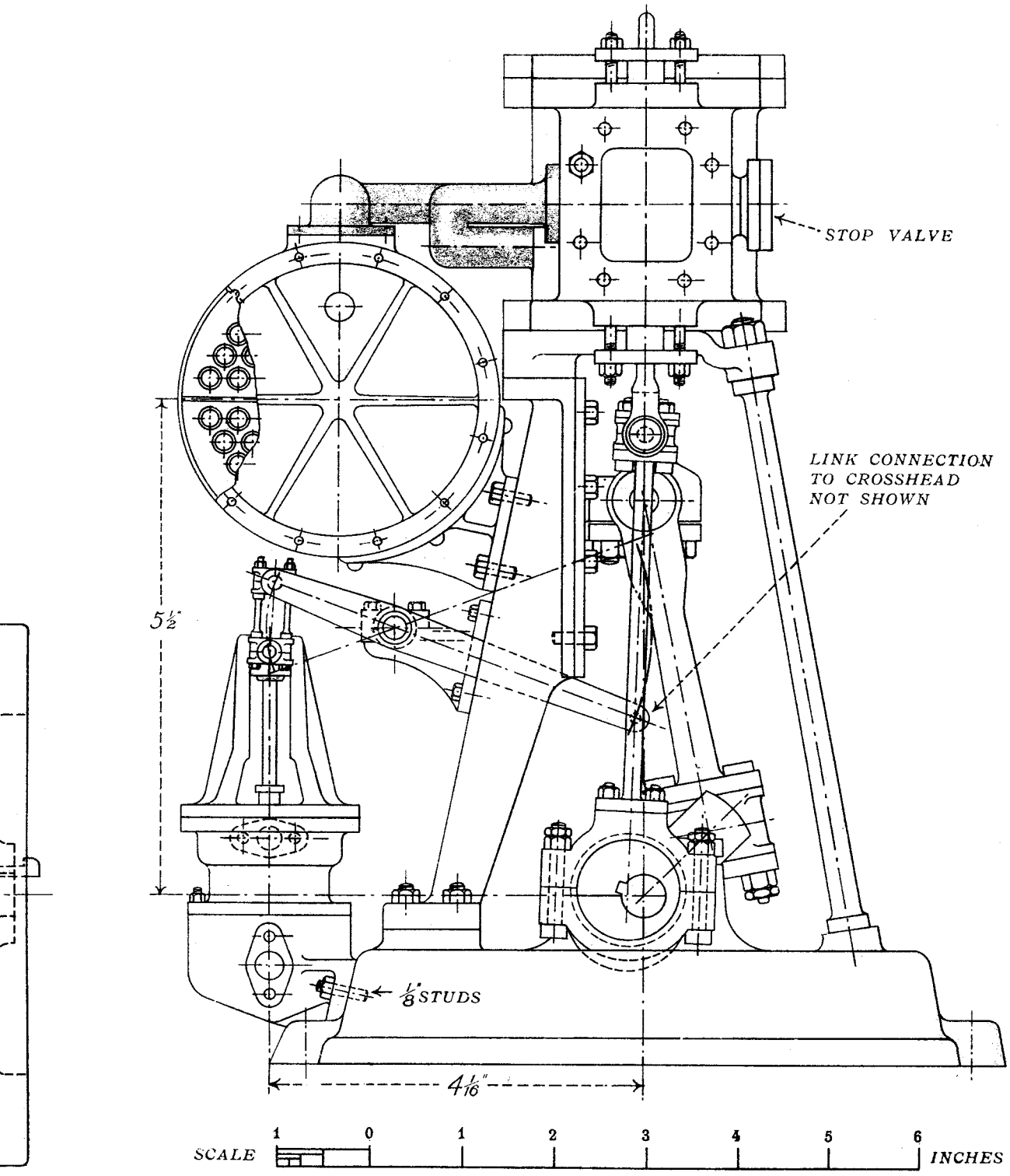


DETAILS OF MODEL COMPOUND CONDENSING ENGINE.

[*Coloured Plate given with this issue.*



GENERAL ARRANGEMENT OF 1½" by 2¼" by 2"



2¼" by 2" COMPOUND CONDENSING ENGINE.

GEO. HARRISON & SONS (BRADFORD) LIMITED. OTLEY.

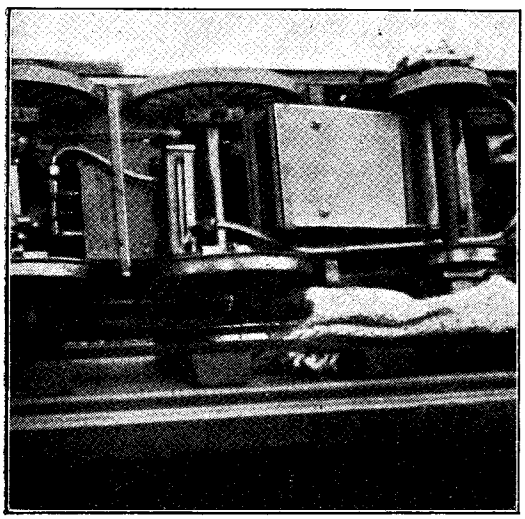
kitchen, where his father had a few tools, as a workshop, using the soldering iron, vice, etc., of the engineers of the distillery. At this period he first learnt the use of the blast pipe. He was not satisfied with the exhaust blowing on to the floor, but wanted to see steam come out of the funnel. So he rigged up an exhaust tube. He was disappointed at not seeing steam come out of the funnel, but was astonished to find the locomotive running at three times its previous speed, owing to increased combustion, due to more air being drawn through. This result was merely accidental, but it taught a good lesson, and since that date he has always made blast pipe arrangements a special feature of his models.

His next locomotive had slide-valve double-acting outside cylinders. It worked well, but the boiler was a failure, so he exchanged the model at a pawnbroker's shop for a large vertical engine, which, when reconstructed, he put to work from one of the steam pipes in the distillery. Then came the construction of what he terms his first real locomotive. This was a G.W.R. type; inside cylinders, single driving wheels, and coal-fired. An illustration of this engine is given in THE MODEL ENGINEER for July, 1899, page 135. It was built for experimental purposes and rebuilt with a new boiler, water-tube firebox, and one cone flue; the water tubes being made of pieces of tube left over from Sir Hiram Maxim's flying machine boiler. These were so thin that they could be crushed by finger pressure, yet would stand an internal pressure of 250 lb. per square inch before they would burst. The boiler was fired by Vesuvius, Primus, and various oil burners of the period. The model was again rebuilt, this time as a 4—2—2, with a new boiler and two cylinders, compound, $\frac{7}{8}$ in. diameter high, $1\frac{1}{4}$ ins. low, by $1\frac{3}{8}$ ins. stroke. The engine could be worked either high pressure or compound by means of a special valve for starting, the valve allowing steam to go direct to the low-pressure cylinder. Firing was by an atomising burner, the oil being blown by steam on to a firebrick arch. This rebuilt engine achieved a record of $10\frac{1}{2}$ miles in one hour non-stop on a 60-ft. diameter circular track. The improvement over the high pressure engine was most marked. The high pressure cylinder was first made to 1 in. diameter, and was afterwards relined to $\frac{7}{8}$ in. When built as a high pressure engine Gooch's link motion was fitted. The next locomotive was his now famous "Cosmo Bonsor." This engine has been rebuilt in various forms to such an extent that Mr. Crebbin suggests that he should rename her "Chameleon." She was conceived in 1900 after a visit to the Paris Exhibition, and the idea came to him after seeing, as he says, "the very poor working of the S.E. engines in comparison with French locomotives." The entire engine was experimental; at first she had two high pressure cylinders, $\frac{7}{8}$ in. diameter by $1\frac{1}{4}$ ins. stroke; was then rebuilt with tandem compound cylinders, high pressure $\frac{3}{4}$ in., low pressure $1\frac{1}{8}$ ins. diameter by $1\frac{1}{4}$ ins. stroke, with piston valves driven by a modified "Joy" motion. She was then rebuilt again, this time with the present cylinders, 1-16th in. larger in diameter, of phosphor bronze, to accommodate superheated steam, because the previous ones were built up. The effect of the superheated steam in these phosphor bronze cylinders caused bad scoring, so they were subsequently rebored and fitted with steel liners and rings on the pistons. The engine was originally designed for sharp curves, and, therefore, had coupled driving wheels, a bogie, and a pony truck. The boiler was designed so that it had a long firebox extended over the coupled axle, it accommodated 24 $\frac{1}{2}$-in. diameter "Field" water tubes, and there were 12 $\frac{1}{2}$-in. diameter flue tubes. The "Field" tubes caused priming to occur and were therefore replaced by U tubes much shorter in length. The first burner used was built on the same principle as a "Locomobile" burner, except that it used paraffin instead of petrol. To prevent carbonising a low pressure was used in the oil-feed, and to obtain sufficient air mixture a jet of steam in the burner was used to draw more air. This burner was discarded owing to the exhaust pulling the flame off it, and also because Mr. Crebbin desired to experiment with atomising burners in conjunction with the late Mr. Charles Palmer, of U.S.A., known to our readers for his steamer *Tigress* and other models; this gentleman being a great friend although only known to Mr. Crebbin through correspondence. Owing to the burner giving trouble at the first MODEL ENGINEER Exhibition (year 1907) through continual starting and stopping, the boiler was converted to burn coal, and may, perhaps, be said to have been the first satisfactory coal-fired model at the next exhibition (year 1909). This (he thinks) probably caused coal firing being taken up to the extent which has been the case since that occasion.

Owing to the popularity attained by this model and the wish of many of its drivers to see it pull a greater load, Mr. Crebbin converted it in 1922 to a 4—6—0, retaining the same boiler. He has given us the following interesting statement: "'Cosmo Bonsor' has evaporated 6,000 to 7,000 gallons of water and hauled about 60,000 passengers."

His next model locomotive, "Aldington," was originally designed as a 4—6—0, and a sketch was sent to Mr. Churchward, Locomotive Superintendent of the Great Western Railway. But on observing the extravagance (Mr. Crebbin says) of the "Claughton" class on the L.N.W. Railway, the drawings were

altered to the present arrangement, as his idea of a locomotive to run on Scottish service between London and Carlisle with trains up to 600 tons weight, at an average speed of 56 miles per hour, on a consumption of 45 lb. of coal per mile. She has four cylinders, balanced divided compound, high pressure 1 in. by 1¼ ins. stroke, low pressure, inside, 1 5-16th ins. diameter by 1½ ins. stroke, working pressure 80 lbs. per sq. inch, driving on two separate axles. Six years were spent in her construction, the war intervening. She was completed in 1921, and is at present undergoing alterations with regard to the feed injector and other details.



Underneath View of "Aldington" Showing New Position of Injector.

The economy of working of this engine is very marked, experts such as Mr. G. Kennion and Mr. W. B. Hart, M.I.Mech.E., of the Society of Model and Experimental Engineers, have remarked upon the black top fire, indicating slow combustion, owing to the soft draught, yet the engine steams freely and shows the "white feather" continuously from her safety valve. At the time of our visit the engine had been taken to pieces for alterations and new fittings to be installed. The feed-water heater has been discarded. Mr. Crebbin has found that cold feed to the front of the boiler is more efficient. He has tried various kinds of oil burners, and eventually adopted coal firing as being more economical. He is fitting a pressure feed lubricator and a whistle, with a box at the lower end, so as to obtain a low note without great length of tube, and do away with the squeak effects usual in model whistles. The following is an extract from a letter recently sent to us by Mr. Crebbin concerning the alterations :—

"The engine has been overhauled and a reversing gear has been fitted to the low-pressure valves, which is now operated from the cab. Also a starting valve has been arranged for the low-pressure cylinders, which is also worked from the cab. This ensures a pressure up to 40 lb. per square inch in the low-pressure receiver for starting, if necessary. A new system of lubrication is fitted as an experiment. It was found that the injector was fitted too high above the low water level in the tender, and so this has been remedied by an entirely new method of fitting below the footplate, and in such a position as to keep it cool. I have found that in these small models when the injector is in close proximity with the boiler, or firebox, it becomes so hot that it requires a fair amount of overflow to cool it down; hence the alteration. All these points have to be discovered by experiment, so that to design a perfect model (for work) is impossible until experience has taught one. This is the continual chameleon peculiarities of my models. The tender has also been overhauled and improved."

Throughout his model making Mr. Crebbin resorts to experiments to ascertain the causes of failures or imperfections. A salient trait in his characteristics as a model engineer is that of being an experimentalist. He finds out what to do and what not to do by means of research. For example, he carried through a series of experiments with glass tubes to discover the circulation which actually occurred in "Field" and other water tubes used for rapid generation of steam. For this he contrived a special apparatus consisting of a water container having ½ in. diameter glass tubes depending from it. Heat was applied by a movable flame having side air nozzles, by which the flame could be directed upon any part of the tubes. In conjunction with Mr. Clive Wilson, he constructed a No. 0 gauge locomotive to prove that a successful engine of the size could be built without having water tubes to the boiler. He is tremendously courageous and enthusiastic in his model engineering, with confidence in his models. On an occasion when exhibiting "Cosmo Bonsor" under steam during a meeting at the Great Western Railway Mechanics' Institution, Swindon, someone criticised the boiler, doubting its strength. Mr. Crebbin's reply was emphatic and characteristic. He took a hammer and smashed the safety-valve, thus subjecting the boiler to a sudden release of the whole of the pressure—80 lb. per square inch. He is very determined when opposed, and thinks that opposition has caused him to do much of his experimenting. When a model has served its purpose he breaks it to pieces in order that, as he says, "I shall not continue to spend time on a done-with model." He has obtained his tools by buying tools and

then selling them at a profit. He has had three lathes—the one at present in his workshop, a 4½-in. centre "Star" screw-cutting lathe—belonged to his friend, the late W. T. Bashford, an accomplished model engineer. He cherishes this lathe by reason of its associations with the past. The kindly way in which he invariably refers to this friend of the past days of model making and the evident regard he has for the lathe, indicates the generous side of his disposition. Beside his determination and enthusiasm, achievements, originality and skill in model engineering, is a deep feeling of sympathy for the efforts of others and towards anyone in misfortune or struggling circumstances, and to beginners. He says "model engineers should never be disheartened. 'Cosmo Bonsor' was built in a windy garret without any daylight at all." Whether defending his ideas or criticising those of other engineers, in debate, or helping to stoke the boiler aboard a steam launch against a strong tide and with dropping pressure, giving help and encouragement to some poor fellow who is in difficulties or trouble, in failure or success, he is "Big Heart" all along. He has been termed the "Model Human Oil Can" because he has smoothed out various tangled matters.

He reminded us that our acquaintanceship had continued for nearly 27 years, and in reply to an enquiry as to his future plans in model-making, said, "I had made up my mind to have a rest from model engineering, but I have had such interesting letters from Australia, South Africa, Colombo, and, what is more remarkable, Cabul, that I feel I should be giving up their pleasure if I were to retire." Then he added jocularly, "I may yet build a 'mystery' locomotive." Mr. Crebbin considers that he is "not much of a draughtsman"; his capability as a mechanic is evidenced by the construction of his locomotives "Cosmo Bonsor" and "Aldington," and that he has drilled a 1-100th-in. diameter hole in an oil burner nozzle by means of his 4½-in. centre lathe is a proof that he can accomplish a delicate job. In connection with his hobby, and the pleasure he has in the constructive part and experimental and working phases, he is greatly interested in actual railway working, and is proud of having the friendship of several eminent locomotive engineers. Among these is Professor Edouard Sauvage, M.I.Mech.E., of the Chemins de fer d'Etat, France, after whom, in token of esteem, he has named his little son. He is very observant and critical of the performances of locomotives on different railways, and used to imagine from year to year what kind of locomotive he would build to cope with traffic, and says that he now sees these ideas come into practice. Amongst his cherished possessions is a photograph of the collection of "locomotive" travelling passes which have been granted to him on various railways. In 1905 he read a paper on "Compound Locomotives and their Work" before the Great Western Railway Junior Engineering Society, at the G.W.R. Mechanics' Institution, Swindon, and in 1908 a paper on "The History of the Compound Locomotive in Austria" before the Swindon Engineering Society at the same Institution, and he now intends to give one upon model locomotives. He has been honoured by being put on the free list of the *Great Western Railway Magazine* for life. A photograph of his locomotive "Aldington," taken by the G.W.R. for Mrs. Aldington, with a photograph of Mr. Aldington, the general manager, was published in its pages, and it is noteworthy as being the only photograph of a model locomotive which has appeared in that journal.

Mr. Crebbin has passed through some of the deep waters of life, and we have heard him on one occasion at least say that he considered that he had finished with model-making. But as the sunshine follows the storm, so we trust that he is going to take a prominent share in it for many years yet to come. He has such tremendous enthusiasm, originality, courage, and ability, so great a desire to promote the hobby of model-making, and so deep a sympathy towards his fellows, that the world of model engineering needs him as an active member. Fortunately the portents are good; he has been elected Chairman of the Society of Model and Experimental Engineers for the new year, and is anticipating to take his customary share in helping with the locomotives on the running tracks at the MODEL ENGINEER Exhibition. "Aldington" is to be the star turn, with "Chameleon," to quote her nickname, as stand-by. With regard to the latter, not long ago he wrote to us: "With reference to the ancient 'Cosmo Bonsor,' I am afraid she will be missing this time. I can hear the editor giving a sigh of relief that the old thing will be given a miss in baulk." But, no, "Chameleon" once more, "the old, reliable, and trusty," we have heard said of her, is to be there. He writes us that he has had an S.O.S. signal saying that "it has been decided that the poor old veteran was the only reliable source in the event of all newcomers breaking down." He has therefore given up three days of a rest holiday to get her into running trim, fitting a new gear, as the pins and working parts of the old had absolutely worn out. He says: "No one without experience can possibly realise the amount of time necessary to be put into an experiment for satisfactory demonstration at an Exhibition. No one would believe the amount of wear that takes place when working them to the utmost capacity on regular Exhibition work. The reason is, of course, that these minute scale

pins, etc., are too small for the use that is made of them. I have now handed the old crock to its old friends, Messrs. Hart & Co. (Mr. W. B. Hart and Committee of S.M. & E.E.) to complete and experiment with, so that it meets with their knowledge and satisfaction for the *M.E.* Exhibition. The injector of the 4—6—2 has been altered so that it works just as though one was turning water from a main into the boiler; in other words, perfectly." "Cosmo Bonsor," alias "Chameleon," attains her twentieth birthday on Saturday, January 5, 1924; she certainly deserves to celebrate the event by a run under steam. Her first complete test was made January 5, 1904, in the presence of the late Dr. T. Hobday. A comment was once made that no MODEL ENGINEER Exhibition would be really complete without "Cosmo Bonsor"; we will presume upon our very long-standing friendship and say that without the presence of "Uncle Jim," any MODEL ENGINEER Exhibition will sadly miss the help which he has always most cheerily given. For "Uncle Jim," as he is affectionately called by some of his young acquaintances, is the friend of all those who make and use models as a recreation. He sympathises with them in their model-making sorrows and difficulties, and he rejoices in their model-making successes. His interest is not confined to locomotives; he has been Chairman of the Model Yacht Racing Association, and President of the Victoria Model Steamboat Club. It does not matter whether the subject is locomotives or model yachts, power boats or engines, his object is encouragement, advancement, and promotion of good fellowship. The discussion may be stormy or mild, the occasion humble or important, the person well known or obscure, the matter light or weighty; he may feel satisfied or dissatisfied, he is human. But whatsoever may happen, sunshine or storm, his main characteristic never fails, he is "Big Heart" all the time.

A. B. (London, S.W.).—Unless you are trying to take too much current from the secondary, the overheating is caused by the primary taking too much current. This is due to insufficient mass of iron in the core, or insufficient number of turns of wire on the primary; in fact the primary does not give enough back voltage. Remedy, more turns of wire in primary, greater mass of iron in core, or divide the deficiency between the two. But open magnetic circuit transformers are difficult to determine by calculation. Heating might be due to short circuits in the secondary winding; or, if you have wound the coils on a metal bobbin, to remedy the heating of the bobbin, cut a slit through it lengthways, or better still wind on a non-metal bobbin. See "Small Single-Phase Transformers," by E. T. Painton, 2/9, post free.

Some Commercial Engineering Models and Their Uses.

By G. GENTRY.

THE enthusiastic modeller is occasionally heard to ask, "What has that to do with model engineering?" referring, perhaps, to something which has appeared in these pages. The question is probably put unthinkingly because he does not find as much reference as he would wish to his particular branch of the art. The actual making and running of more or less scale models of prototype steam, gas, oil, petrol, or electric engines, in the minds of many, constitutes the whole subject of model engineering, whereas it is really only one branch. If the question took this form, "What hasn't to do with model engineering?" it would meet the case, and be far more to the point, as the writer will endeavour to show.

Take the two words "model engineering" and endeavour to define the second. In its limitations it is practically indefinite. What, for instance, is an engine? The word is derived from the Latin *ingenium*, which is a combination of our words meaning genius and invention, and, therefore, in ordinary language the word can be applied to any apparatus typifying inventive genius. Specifically, as applied to mechanics, an engine is a machine of complicated parts which acts automatically both as to power and operation. Next, what is an engineer? In ordinary language he or she can be defined as a person of genius or ingenuity, and specifically the definition is: "One who is skilled in any of the branches—military, naval (or marine), mechanical, or civil engineering." Finally, we have the actual word "engineering." This is defined as the art or science of constructing engines and machines, and of planning and executing such works and apparatus as fall under the four great headings given above. One can therefore find some industrial operations which are not strictly engineering, but none which do not use engineering in some way or other to attain their ends. If you think therefore of the range which the word can cover it is much easier to think of what isn't engineering than of what it is as a whole. The qualifying word "model," again, is derived from the Latin *modulus*, a standard, and its meaning in our language is a copy of a particular form, shape, or construction, intended to be imitated; generally made in miniature, but not necessarily so. Briefly put, a model is a copy either of something already made, or of something original to act as a standard. It has other meanings also which give the word

a range that, put in conjunction with the word "engineering," makes the subject covered by the title of this journal something a great deal vaster than can be expressed only by miniature working engines as we know them.

This being the case, one may quite legitimately occasionally refer to the more serious side of model work, as exemplified in commercial engineering models. Elsewhere in THE MODEL ENGINEER a complete list is given of such kinds of models which were used and exhibited at the recent Shipping, Engineering, and Machinery Exhibition, held at Olympia during the first three weeks of September. In the following article will be given some photo illustrations of a few selected models seen at the exhibition or elsewhere, and comment made upon their construction in relation to their prototypes, and their uses either as demonstration or exhibition models. Perhaps one of the greatest uses to which models can be put commercially is that of demonstration, and it hardly needs further comment on the uses of models for advertisement purposes to enhance their value in that respect. Indeed, in some cases, the only possible means of making an exhibit of an important engineering product is by means of models. In this same exhibition a firm of marine engineers made their chief exhibit a very fine scale working model of their standard pattern quadruple expansion engines, shown moving. It will be illustrated further on, but the point now is that it is obviously impossible for such a firm to bring to Olympia and exhibit set up, the prototype engines, and, further, if their name is a byword with marine engineers it is not likely to be with the general run of visitors to such an exhibition. The interest this model alone created with both old and young, male and female, proves that many must have gone away with that firm's name fixed in their memory, which is the result aimed at in all good advertisement. Another well-known firm, whose speciality is petroleum, could only put up a more or less ornamental stand, as petroleum is not a material which lends itself to forming an interesting exhibit. The interest, however, in this case was chained by the central stand exhibition of a very fine working model of a well-boring plant, which really was the only means—and an effective one—of showing the public something that they would not forget, and something that made it to an extent worth their while to pay at the turnstiles. As a matter of fact, models were not used at this exhibition,

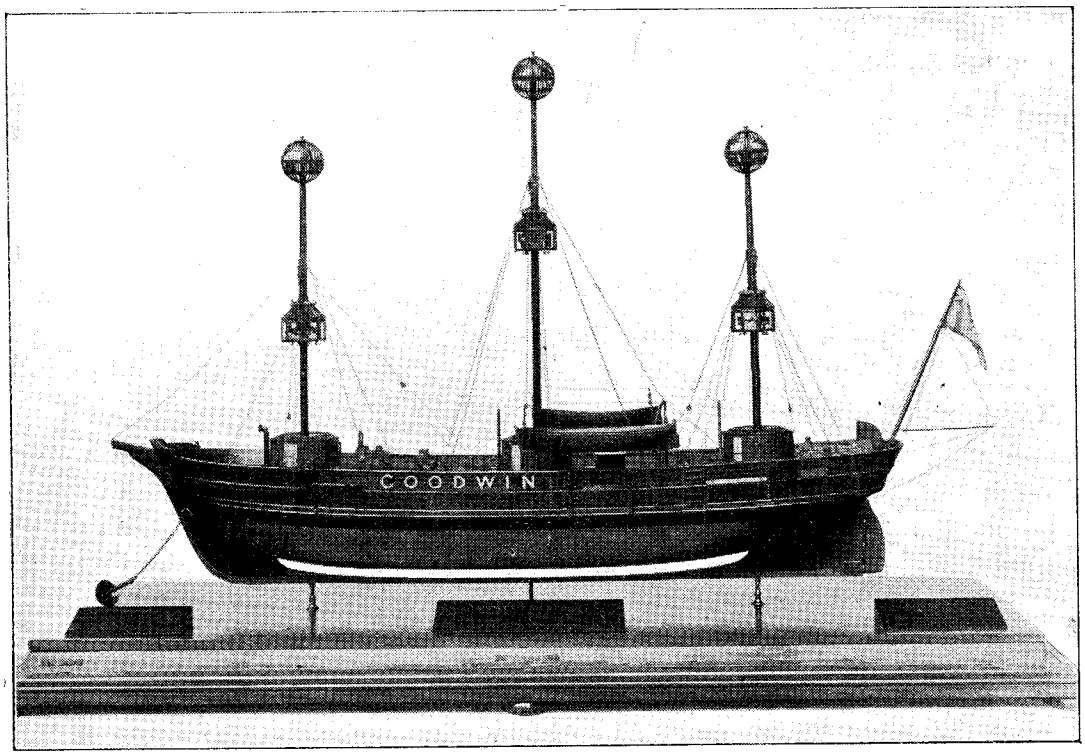


Fig. 1.—Port Side View of one of the Old Goodwin Lightships.

either for demonstration or advertisement in anything like the numbers they might have been and to the advantage of both exhibitor and visitor, as perhaps the writer's further notes may show.

By far the largest proportion of models were those of ships. Most of these were of the glass showcase variety, quite common as advertisement models in the shipping offices. As working models they are of no account, but in respect of their extreme neatness of finish, and accuracy of assembly of parts, form a lesson on construction which all model-making enthusiasts might well emulate. Among the ship models the two most interesting exhibits were those of the Corporation of Trinity House, who showed, with general lighthouse and buoy models, some fine lightships. These we will enlarge on. Another fine model exhibit was that of Messrs. Werf Gusto, of Schiedam, near Rotterdam, makers of floating cranes, dredgers, coaling vessels, etc. The writer was unfortunate in being unable to obtain photos of these models, but they included models of electrically-driven, self-propelling, derricking and revolving floating cranes, to a scale of 1-40th; a canal excavator to a scale of 1-20th; a model of a seagoing twin-screw hopper bucket dredger; and a model of a self-propelling coaling vessel to a scale of 1-25th. For the most part these were of the showcase variety, rich in plated and bronzed parts, but none the less the detail in the mechanical apparatus was of a kind truly wonderfully finished.

The Trinity House Models.

Of all the ship models these should be of the greatest interest to our readers, especially as the Elder Brethren of the ancient Corporation have kindly given us permission to take and reproduce such photos of light vessels and lighthouses as may serve to illustrate this branch of modelling. Thanks are also due to the authorities of the Science Museum, South Kensington, where all the models are permanently shown as loan exhibits, for the use of their photographic studio for this purpose. Some points on the history and placing of the prototype vessels will not be out of place. Fig. 1 is a view on the port side of a model of an old pattern of one of the Goodwin lightships. Fig. 2 is a view on the starboard side of the same model, in which the planking of the hull has been omitted in order to show the hull construction. Within, the cabins, lockers, oil tanks, and other fitments

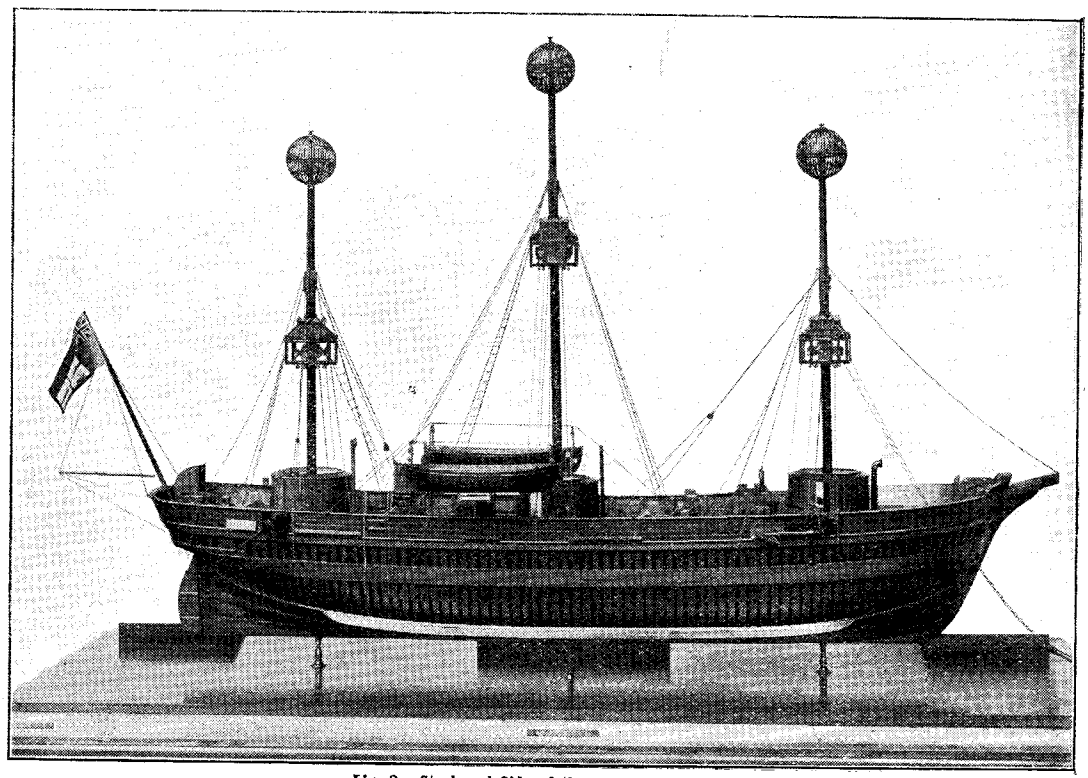


Fig. 2.—Starboard Side of the Model shown in Fig. 1.

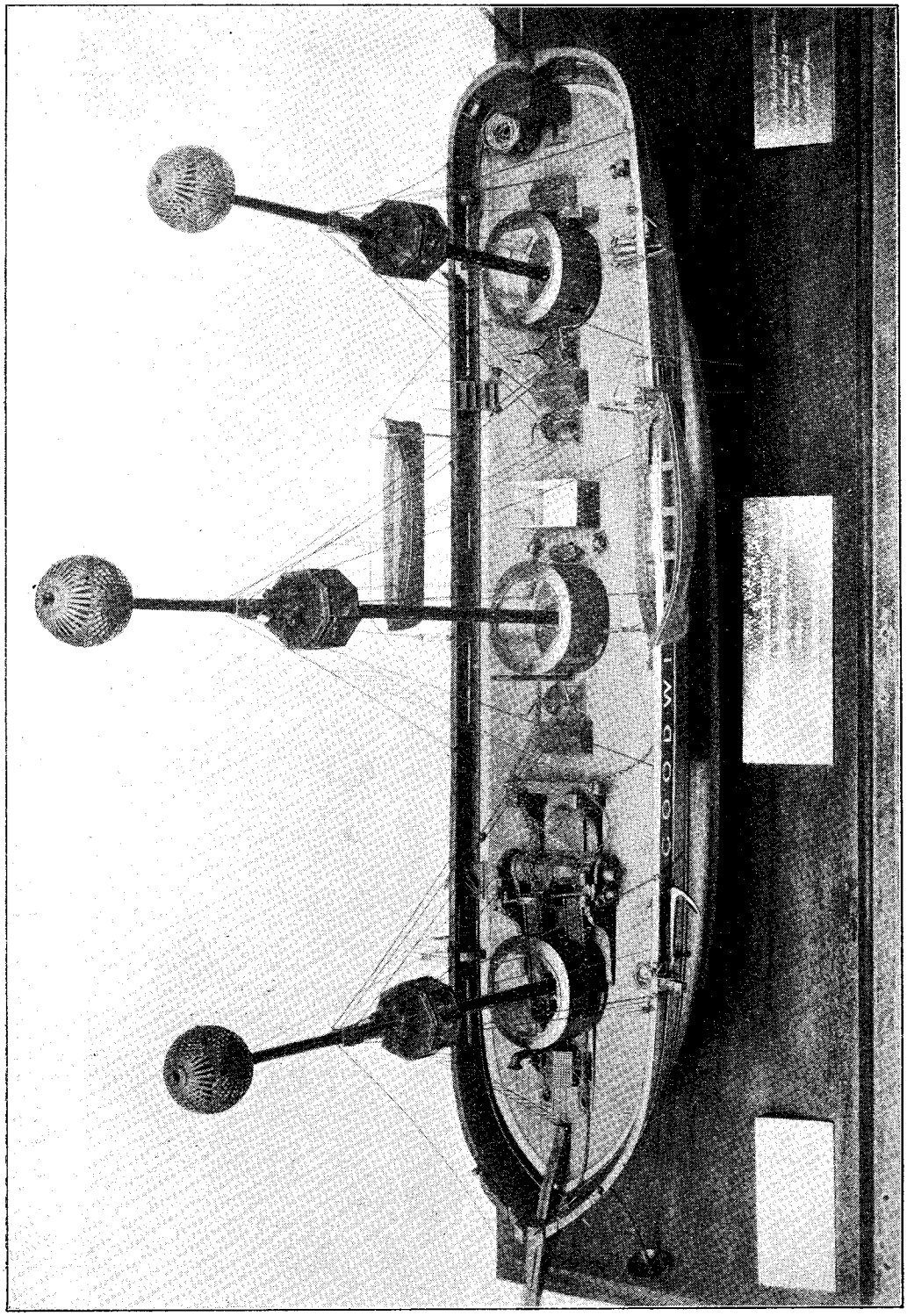


FIG. 3.—A DECK VIEW OF THE OLD "GOODWIN" LIGHTSHIP MODEL.

are complete. Fig. 3 is a deck view of the same model. The date of the pattern is about 1865, and as a piece of ship modelling, in which true realism is apparent, this is one of the finest the writer has seen. The scale is $\frac{1}{2}$ in. to a foot, and the model represents in faithful detail a one-time lightship moored at the North Sandhead of the Goodwin Sand Shoal.

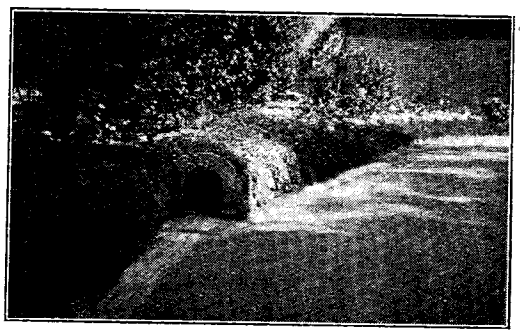
The Goodwin Sands partially fill a big coast-line depression between the North and South Forelands, on the Kentish East Coast, in the northern neck of the Dover Straits. The depression forms Pegwell Bay, the estuary of the River Stour, Sandwich Bay, Deal, Walmer, and Kingsdown, the North Sandhead being about opposite Pegwell Bay, and the South, Kingsdown. The ridge line of the sand, which is about 10 miles long by 3 to 4 miles wide, was originally a single cape of the mainland, but is now quite 6 miles from the coast. It is on plan lobster-shaped (as curled-up, dead), the body running nearly north and south, head downward and the tail curled downward, south by west, on the land side. It was formed by an inundation in the eleventh century, and was traditionally part of the lands of the Earl Godwin, hence its name. The headland portion of the sandbank forms a natural breakwater, and the huge valley between it and what is now the mainland provides one of the finest natural anchorages and protected roadsteads in the world. It is, as is well known, called the Downs. In the depression of the lobster, between its tail and body, on the land side, is a charted but unmapped bay, named by hydrographers Trinity Bay. The sand at low water is about 5 ft. above waterline at its high points, and at high water is about $2\frac{1}{2}$ fathoms deep. The surf at low water breaks upon it in a long seething line, and land residents, when weather permits, sometimes go out by boat and picnic thereon. At the north end the fairway, between it and a number of sand shoals—called the Brake Sands—lying in Pegwell Bay, is charted as the Gull Stream, and marking the limit of the main sand—represented by the lobster's tail—is a lightship named the *Gull*, which is therefore moored in the Gull Stream, and forms the West Goodwin light. There are four lightships in all: the one just mentioned being opposite Sandwich; the *South Goodwin* (locally known as the "South Sandhead Light") opposite Hope Point, below Kingsdown; the *East Goodwin* right out to sea some ten miles opposite Deal, and locally known as the Middle Light; and, finally, the *North Goodwin*, moored a mile or so above the North Sandhead, almost exactly opposite Ramsgate Harbour, known locally as the North Sandhead Light. The latter and a gas-lighted buoy, nearer Ramsgate, mark the opening of the Gull Stream, and vessels at night, and especially at low water, have to manœuvre with these, the *Gull* and *South Goodwin*, in order to make the Downs safely. This, briefly, is the layout of the Goodwin Sands and its lights, and readers will realise how that such an hydrographic obstruction, as well as a coast protection, has gone to make more history of wreckage, and reputations of such as the Ramsgate, Deal, and Kingsdown lifeboats, than have most of the banks of that bank-logged water, the North Sea.

The particulars of the lightship as it was then (about 1865) are: Length, 96 ft., by breadth, 21 ft., by depth in hold, 10 ft. 8 ins.; tonnage, 195 59-94th; weight of mushroom, 42 cwt.; chain cable, $1\frac{1}{2}$ ins. by 210 fathoms long. By referring to the deck view, Fig. 3, it will be seen how complete are the fittings. The signal guns, port and starboard, aft; the winches for lowering the lanterns to the trimming cabins; the cable winch; and even such items as the signal gong, hand-lead, log, and drift lines are all in place. This ship showed three white fixed lights at varying heights, the masthead globes being for day identification.

(To be continued.)

The Preliminaries of an Interesting Model Railway near Hazlemere.

A PHOTOGRAPH is given here of the Flower Bank Tunnel on the Higher Coombe Model Railway. This is now being made by Mr. Bailey, of Higher Coombe, Hazlemere, round his delightful grounds near there. The line is being constructed throughout by the owner from standard $\frac{3}{4}$-in. scale permanent way



The Entrance to Flowerbank Tunnel.

parts supplied by Messrs. Bassett-Lowke, Ltd. The gauge is $3\frac{1}{4}$ ins., and several locomotives have also been built. Mr. Bailey is now on a world tour, and on his return intends to proceed with all speed with the line, and hopes to invite members of the S.M.E. down early next spring to view it.

Workshop Notes and Notions.

Short practical notes of workshop interest are invited for this column. Contributions must be based on the sender's own experience and should be marked " WORKSHOP NOTES *" on the envelope. Accepted items are paid for within a few days. Unaccepted notes will be returned if a stamped addressed envelope be enclosed.]*

A Bell-Chuck from Scrap.

Like most engineers I am very fond of making tools from odds and ends picked out of the scrap-box. The bell-chuck here illustrated and described was made from old bronze motor-cycle bearings.

The first stages of construction are shown in the sketches. Fig. 1 shows simply a plain bush

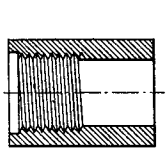


Fig. 1.

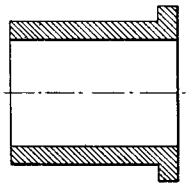
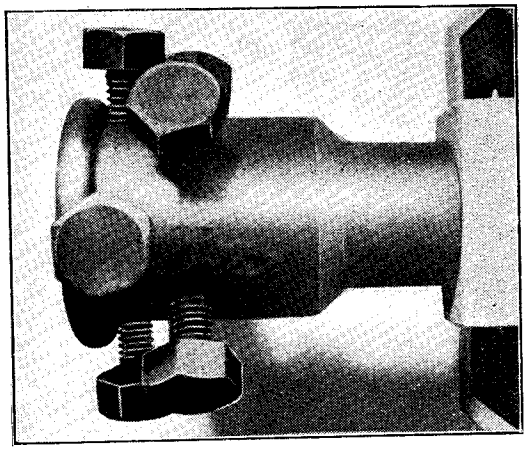


Fig. 2.

screwed to fit the lathe nose. It is necessary to counterbore this to bed well on the mandrel-collar.

When fitted to satisfaction turn down to fit the bore of Fig. 2, which is also a bush, but in this case has a flange. When the flange is finally rounded off as shown in the photo it adds considerably to the appearance of chuck.

After turning the first bush to size, the



The Completed Bell Chuck.

second, or bell proper, is sweated on and pinned with brass pins driven through both. Drive pins a little below the surface and solder the ends over. It is then put on the nose and turned up in *situ*. It only remains to drill and tap eight holes for the set-screws. These are ¼-in. Whitworth.—J. A. LLOYD, M.B.A.A.

Square-ending a Drilled Hole.

It occasionally happens that, for some reason or another, a blind hole is required to have a flat bottom instead of the hollow cone as left by the ordinary drill. A method which can be successfully adopted where only one or two holes require such correction is to take a piece of silver steel of diameter equal to that of the hole, and file away half the thickness at the end, leaving a somewhat hooked lip as shown in Fig. 1. The half-diameter remaining must now be slightly backed off, taking care that the edge is kept straight, and at a *very slight* deviation from the true perpendicular to the axis. On hardening and tempering this to a straw, it can be fed gently into the hole, when it will remove the cone portion, and leave the bottom of the hole nearly flat, really a little higher in the

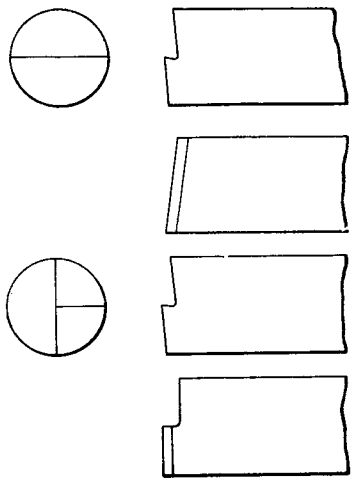


Fig. 1.

Fig. 2.

Making a Tool for Bottoming a Drilled Hole.

centre. For some purposes, such as valve seats, this is all to the good, and in most cases it is too slight to be of importance. If, however, a dead-flat bottom is desired, all that is necessary is to finish the drill end *quite* square across, and then remove half the cutting edge altogether to allow for cutting clearance (Fig. 2).—NATHAN SHARPE (Member, S.M. & E.E.).

Countersinking.

When countersinking holes in the drilling machine considerable difficulty is usually caused by the drill chattering and running out, entirely spoiling the appearance of the work.

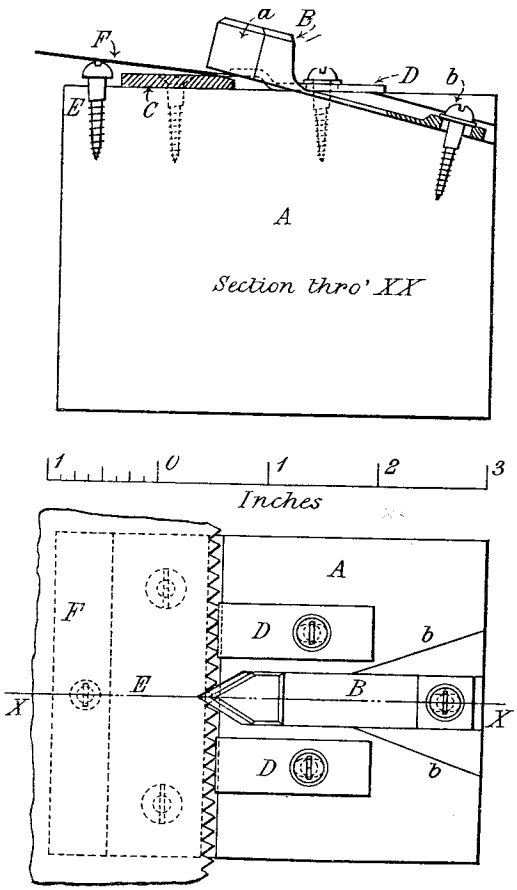
The following dodge entirely obviates this :—

A piece of old rag is folded over two or three times, and laid over the hole. The drill is then fed down carefully, and as soon as it is felt cutting through the rag, it is withdrawn, a fresh part of the rag placed over the hole, and the process repeated several times.

A Saw Setting Device.

By H. V. N.

A IS a rectangular block of tough hard-wood, such as beech or birch, with a sloping groove or channel cut in its upper face for the spring hammer B. C is a strip of spring or tool steel, with one corner bevelled off, screwed to the block A by two countersink-headed wood screws. D, D are two pieces of strip brass, bent as shown, to act as stops. E is a button-



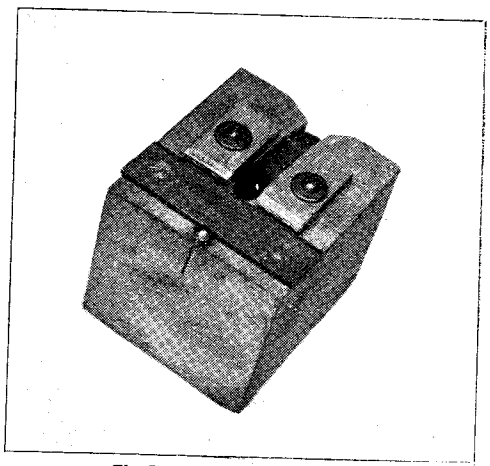
Elevation and Plan of Saw-Setting Appliance.

head wood screw, screwed in stiffly, for varying the angle of set, the amount of which, of course, depends on the size of the teeth. F shows part of a saw blade, with one tooth in position ready for being set.

It will readily be seen that if the block A is gripped in a vice, the saw blade held in the left-hand, and a light hand hammer in the right-hand, each alternate tooth may be brought centrally under the vee point of the spring hammer, the other teeth touching the stops, and by striking at "a" these teeth will all get the same set. The saw is then turned end for end so that the other side is now uppermost and the process repeated with the remaining teeth, thus ensuring a uniform and symmetrical set.

To provide adjustment for various pitches of saw teeth the stops D and the end of the spring hammer have slot holes for their fixing screws; and to make screw for the latter get-at-able the corners "b" of the channel are pared off.

The anvil piece C should be hardened and let down to a medium brown, and as it is only the part which comes under the hammer point that matters, the tempering may be done by directly heating it at the ends The hammer can be sawn out of square tool steel, or forged, as preferred; it needs hardening like the anvil, but there is no need to temper the spring part, as there is ample springiness in it if quite soft.



The Saw Set as originally Rigged Up.

Saws appear to work best when the teeth are set over along the line through the bottoms of the notches forming them, the amount of set at their points being about one half the saw blade thickness. The apparatus can be adjusted, to give such result, as follows:—Adjust the screw E up or down until the angle or amount of set is about right. This may be judged by means of a straight edge resting on the top of the screw and on the anvil piece, holding the whole thing up to the light and glancing the eye along the bevel. Be careful not to let the end of the straight edge overhang the bevel more or less than the height of the saw tooth. The angle seen between the end of the straight edge and the bevel can be varied, by the screw E, until the space between the end of the straight edge and the bevel is judged to be about half the saw thickness; err on the side of too little rather than too much, as it is easy to give a little more and not advisable to have to reduce

it. Then adjust the stops D to make contact with the teeth points, so that a line through the bottoms of the notches forming them lies exactly over the line of the bevel on the anvil. The hammer point is now adjusted until its point is as far as it can be over one tooth without fouling the two adjacent ones. Then proceed with the setting as described above. Though primarily intended for straight saws the device could be easily modified, with new stops D, for use with circular saws.

For the Bookshelf.

THE PRACTICAL ELECTRICIAN'S POCKET BOOK, 1924. London: S. Rentell & Co., Ltd. Price 3s. net.

The twenty-sixth edition of this useful book has been carefully revised and kept in every way in line with present day installation practice, thus maintaining its reputation as a most convenient pocket manual for every contractor, foreman and wireman. The chapter on the many wiring systems now on the market is very comprehensive, while other sections, including wireless broadcasting, make the book directly useful to a very wide circle. The 50 pages of Central Station tables will be of constant service to all engaged in the supply of electric apparatus for working from the mains. We are glad to see that the publishers have been able to return to the serviceable pre-war cloth binding, and we have no doubt the book will continue to appeal to a large circle of electrical readers.

THE MECHANICAL WORLD YEAR BOOK, 1924. Fully illustrated, 348 pp., foolscap, 8vo, cloth. (Emmott, 1924.) Price 1s. 6d. net (post free, 1s. 9d.).

This, the thirty-seventh annual issue of this widely-used pocket-book, appears to have been carefully revised and brought up to date. A new and lengthy section on the combustion of fuel has been added, containing a number of new tables on the composition and properties of air; air required for combustion; weights and volumes of air and products of combustion; calorific values of fuels, solid, liquid and gaseous, etc. A new section on the strength of flat plates embodies a concise summary of the various rules for calculating the strength of rectangular, square and circular plates, and includes the results of the most recent investigations. A new section on tanks includes notes on the thickness of tanks, staying and riveting and capacities of tanks. The work includes the usual very complete subject index, and a reference list and classified directory of engineering materials and supplies, with the names of the engineering firms from whom they are to be obtained.

A Model Engineer's Work in the Transvaal.

By L. M. SMITH.

PERHAPS these snapshots from a South African apple orchard may be of interest to readers of THE MODEL ENGINEER. The tractors are Fordson. Fig. 1 shows one in action, cultivating; the dust does not show in the photo, but may be imagined. Fig. 2 shows another, very much out of action, with your humble servant. The native, kneeling, goes

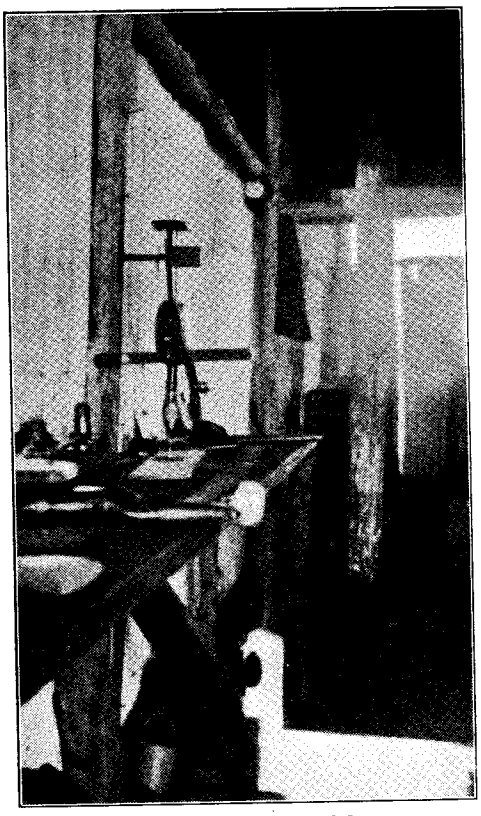


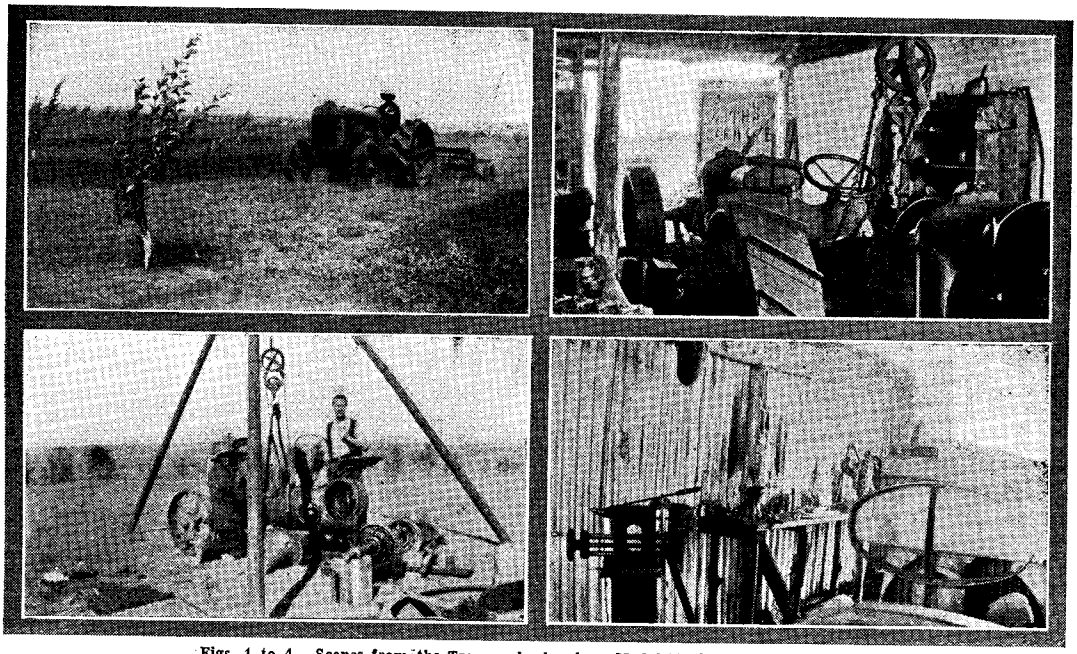
Fig. 5.—A Corner of the Workshop.

by the name of John, his other name being unpronounceable. The trouble is caused by a broken ball in the worm shaft bearing, and hunting for scraps of broken ball under our hot sun is hardly a pleasant occupation. Figs. 3, 4, and 5 are views of the garage. Fig. 3 is rather confusing; it was taken in the dry season, when the tractors are not used. Three are shown here in various stages of repair. Fig. 5 shows a breast drill rigged up for drilling thin plate, etc.—a real South African makeshift. On the left is a connecting rod set up for remetalling on an improvised jig. The principal item in

Fig. 4 is the gadget known as a "handy worker," an exasperating affair of American origin. It comprises vice, anvil, emery wheel, drilling machine, and pipe vice. It performs its work indifferently, and is the cause of much bad language, to say nothing of time lost in converting from one to another of its various uses.

We have three tractors, and usually keep two running, while the third is being overhauled. They do good work when in good order, and do it quickly, but the tremendous amount of dust here causes a lot of wear. The coils are a constant source of trouble also.

Most farm machinery out here appears to be run to the last gasp, and then patched up with whatever material happens to be handy, worked with the minimum number of tools possible. At least, that is my impression, but perhaps I have been unfortunate in my experience.



Figs. 1 to 4.—Scenes from the Transvaal wherein a Model Engineer Is Playing his Part.

In a recent address to Manchester students, Sir George Beilby, late Director of Fuel Research, warned the research students that the true pioneer needs to be something more than scientifically trained. The unknown pioneers who found out how to supersede flint implements with implements of bronze probably knew little of contemporary science. In those days it was, even as it is now occasionally, a matter of trial and error, worked in conjunction with keen observation.

Practical Letters from our Readers.

A Yearly Grouse.

To the Editor of *The Model Engineer*.

Dear Sir,—You have been patient and good enough to bend down and listen to my yearly grouse for a number of years now, and I feel that as the time of year has now come round for lodging of same, you would be disappointed, if not actually "worried," about me were I to neglect this matter.

My grouse this year is "Wireless"; in one issue alone we got *two* articles on this one subject. Wearied by it, I kept turning over the pages, in *hopes*, only to receive a "right and left" from "The Fuse," which put me down for the full count.

Let other readers have their wireless, but not all in one issue. For my own part, I am too energetic to sit listening-in; I have tried it, and grew weary sitting.

It beats me hollow how the average man (assuming he be married) can have any stomach for *additional* listening.

In case your wireless enthusiasts think me a grumbling old humbug without any soul for their pet hobby, let me say in self-defence that I have had recourse to their wireless under conditions that may interest *them*. Instance: we used an old hay chopper (the geared drive part),

coupled by belt to dynamo, and sent out messages from Table Island, the station proper having been burnt down. I, in *turning the handle,* was disgusted for all time with wireless, when the operator told me he had only called "Camperdown," and had *not* commenced to send the message proper!

Writer has at different times sent out wireless messages carrying fearsome purports, such as "Taking refuge St. Paul's Island; limited food; no further means communicating you" (at a time when the Island's cable had carried away).

The bare mention of wireless irritates *me;* it usually bears ill tidings, and means a tempestuous journey to somewhere—full of soul, I'll admit; *too full* at times.

A Merry Christmas, anyway.—Yours truly,

P. W. WILSON.

Society and Club Doings.

Secretaries are notified that all notices of forthcoming meetings must reach us 10 days previous to date of publication of any given issue.

Model Engineering.

The Society of Model & Experimental Engineers.

MEETINGS.—The next meeting, at Caxton Hall, will be held at 7 o'clock on Thursday, January 31.

M.E. EXHIBITION.—Those members who have given in their names as willing to assist at the stand and track are thanked, and further promises are desired. By this time you will know when you will be free to attend, so please write to the Secretary, giving him the *days* and *times* when you can attend. Opening time and afternoons are somewhat difficult for many, so if *you* can manage it, please give one or more. Remember "Many hands make light work," and a big roster means an easier time for all. Address letters to The Secretary, S.M. & E.E., c/o The Editor of THE MODEL ENGINEER, Royal Horticultural Hall, Vincent Square, S.W.1.

WORKSHOP.—The workshop *will be closed* for the *M.E.* Exhibition from January 5 to January 10, inclusive.

The January Rummage Sale will be held at 7, for 7.30, on Monday, January 14, and a demonstration will be given by Mr. G. Kennion on "Boring and Lapping Cylinders" on Monday, January 21, at 7 o'clock.

Full particulars of the society may be obtained from the Secretary at S.M. & E.E. stand in the Exhibition.

Manchester Society of Model and Experimental Engineers.

At the ordinary meeting, held at the Clarion Café, Market Street, on Tuesday, December 18, 1923, the exhibits shown were: Mr. Tucker, compound marine vertical steam engine; Dr. Pinson, a power-driven duplex gas compressor. The workmanship of these was most excellent.

The only meeting in January, 1924, will be on the 15th.

Hon. Secretary: R. STUART NICHOL, 405, Stretford Road, Manchester.

The Glasgow Society of Model Craftsmen.

(Meeting Place, Royal Technical College.)

The Glasgow Society of Model Craftsmen held their December meeting in the Mechanical Engineering Laboratory of the Royal Technical College.

The subject for the evening, "Troubles and Problems in Model Engineering"; the speaker, Wm. Fairbairn, Esq. (owner of *Rob Roy*), dealt with his experiences in model-making, his hopes and fears when a model was near completion, how troubles were met and overcome, the handicap of limited tackle, etc.

NEXT MEETING.—The next meeting will be on January 10, 1924. The subject will be "Lathes for Amateurs."

Hon. Secretary: D. C. YOUNG, 198, Berkeley Street, Glasgow.

Notices.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall & Co., 66, Farringdon Street, London, E.C.4. Annual Subscription, £1 1s. 8d post free to all parts of the world.

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The Editor invites correspondence and original contributions on all small power engineering, motor and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

Contents.

The asterisk (*) denotes that the subject is illustrated.